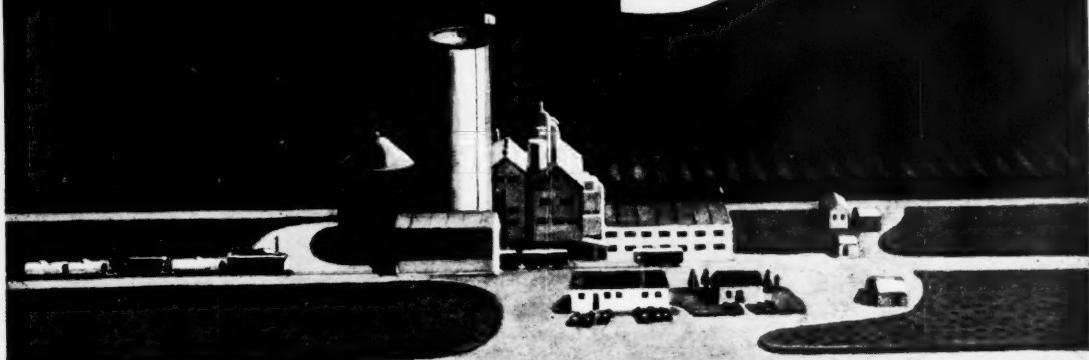


UBBER OLD

FEBRUARY, 1913

ANOTHER SPHERON PLANT CONVERTED TO

GRADE



GODFREY L. CABOT, INC. BOSTON



FEB., 1943

Neoprene Latex Makes Better Products — Helps Conserve Rubber

THREE ARE THREE REASONS why rubber chemists interested in contributing to the rubber conservation program should promptly investigate the use of neoprene latex.

1. Any product that can be made from rubber latex can be made from neoprene latex.
2. The resultant neoprene products are uniformly superior in resistance to the effects of oils, chemicals, heat, sunlight, ozone and aging.

3. A substantial increase has been made in the production capacity for neoprene latex to take care of an expected increase in demand. This additional production may be used for those applications approved by the War Production Board.

MANUFACTURING PROCESSES SIMILAR—Neoprene latex can be used in plants designed for rubber latex with only minor modifications in plant or process. Basically the processes for rubber and neoprene are identical. The adjustments necessary are individual plant problems, and will vary with the existing equipment, plant layout and the product being made. A detailed discussion of advisable process modifications would be of little value, but the data given below may be helpful in determining the nature of the changes which may be necessary or advisable.

A comparison of the major processing steps employed in the manufacture of a product made from rubber and neoprene latices is given below.

TEST COMPOUNDS		
	Rubber	Neoprene
Rubber from 60% centrifuged latex	100	—
Neoprene from Type 571 latex	—	100
Zinc Oxide	2	3
Sulfur	1.5	—
Neozone D—Dist.	2	2
Tepidone	1	—
Casein	0.25	0.25
Aquarex D	0.25	0.25

PROCESSING—Films and articles may be made from either formulation by coagulating dip, straight dip, molding, spraying, spreading, impregnating, or extruding. Both require protection from freezing, acids, and salts.

DRYING TIME—Rubber films dry faster than do those of neoprene. The rubber film described by the recipe requires two hours drying time at 158 F. The neoprene film requires 4 hours at 158 F.

VULCANIZING—In general rubber latex films cure somewhat faster than do neoprene films. For example, the cure time required to secure optimum physical properties for the rubber vulcanizate is 20 min. at 212°F— for the neoprene compound 30 min. at 284°F. Neoprene films must be cured after drying since neoprene latex does not lend itself to pre-curing in the wet state.

PRODUCT SUPERIORITY PROVED BY TEST—The greater stability of neoprene latex products has been shown by laboratory test and proved by industrial applications made over the past ten years. Physical tests on the vulcanizates of test formulas show the superior stability of the neoprene compound.

TEST COMPOUNDS		
	Rubber	Neoprene
Gauge	0.03	0.03
Stress—500%	825	600
T _b p.s.i.	5300	3900
E _b %	800	900
Permanent Set	3	4
Aged in oxy. bomb 21 days—T _b —E _b	3000	3800
% T _b Retained	700	850
Immersed in kerosene 24 hrs. @ 82°F. T _b	disinteg-	2000
Aged in direct sunlight 30 days south. N. J. T _b	Too weak to test	3500
% T _b Retained	0	90

We believe that a thorough investigation of neoprene latex at the present time will prove of value to all manufacturers of latex goods. The necessity of conserving natural rubber is well known. Neoprene latex will be invaluable as a direct substitution and will prove of even greater value in that its use extends the life of products made of it and thus reduces need for replacement. Start now so that you will be in position to utilize the increasing supplies of neoprene latex.

LATEX BULLETIN AVAILABLE—Neoprene Latex Type 571, its properties, handling, compounding and processing are discussed in a new bulletin just received from the printer. The bulletin gives sufficient information to enable latex technicians to develop mixes suitable for the production of practically all articles normally made from natural rubber latex. The bulletin will be sent to any rubber company technician requesting it on company letterhead.

Through the Mill



THE PROPERTIES OF DUPONT RUBBER CHEMICALS is the title of a new booklet which gives pertinent information on all of our chemicals currently being offered the trade. This booklet, a must for every rubber man, is now being distributed. If you are a member of the rubber industry and can use our chemicals in your work, we'll be pleased to send you a copy.

A CRITICAL SITUATION exists in regard to the supply of metal containers. This shortage makes it necessary that we have returned to us the empty metal drums in which our liquid products are shipped. We will pay the freight or truck transportation charges from your factory to our producing plant and we will credit it you at the ceiling price for those containers returned to us in usable condition. In order to facilitate the cleaning of the drums at our plant, will you kindly wash them out with water promptly after the contents are removed and replace securely the bungs or lids to prevent contamination in storage and during shipment. Your cooperation in this effort to salvage these empty containers will make it possible for us to continue to supply you with those products which must be shipped in metal drums.

JACKET STOCKS FOR WIRE insulation which have excellent processing properties are described in a new report now being distributed. The report also contains comments for increasing the speed of cure of Buna S and neoprene. THE PREVENTION OF FUNGUS GROWTH on rubber and neoprene coated fabrics is covered by a recent investigation which has led to recommendations which merit the attention of the compounder.

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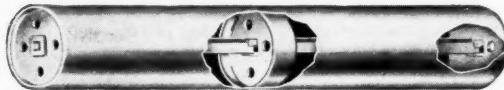
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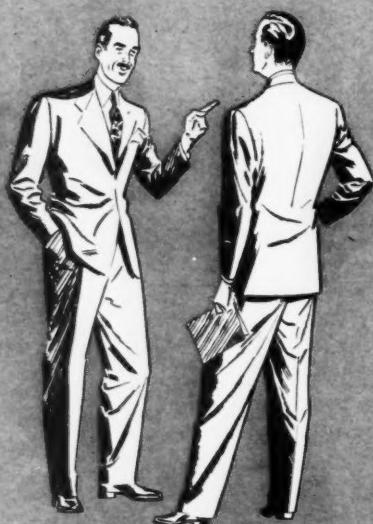
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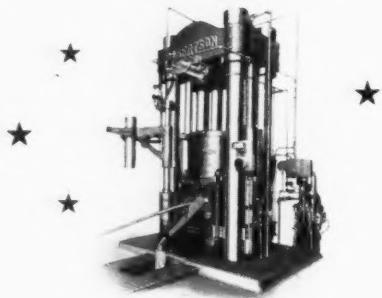
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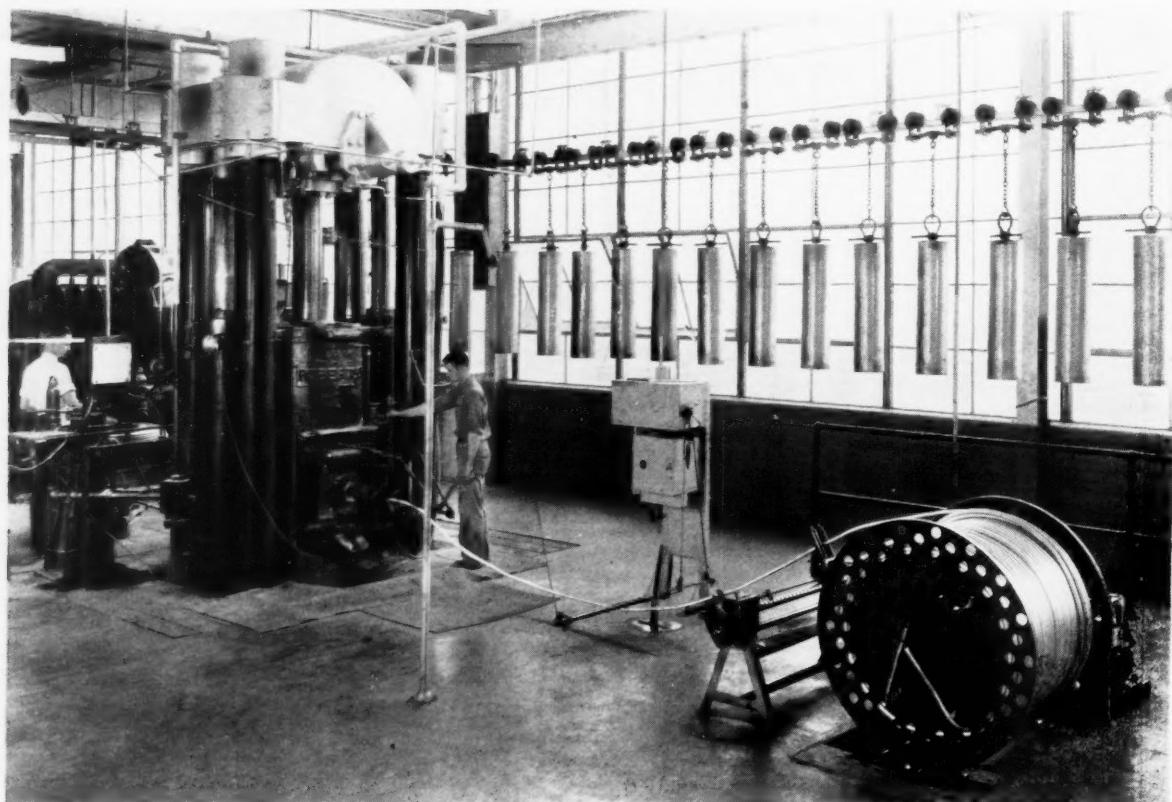


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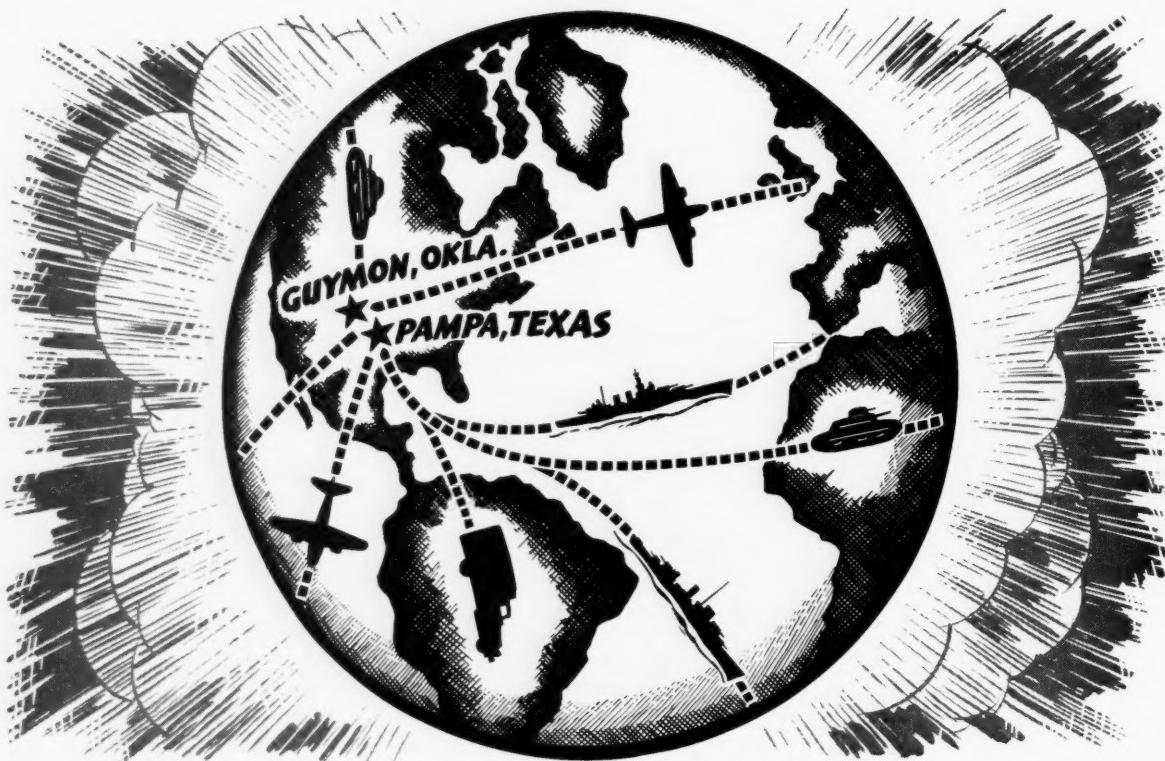
The standard test strip, or "dumb-bell", pictured here shows 500% elongation, a stretch that's commonplace enough today, but one that for this particular type of stock would have been a major achievement less than a year ago without sacrificing tensile, or other desirable characteristics. Because tensile was actually improved rather than impaired, we believe this example is an unspectacular but practical illustration of the kind of benefits rubber fabricators can realize when they bring their products and problems in synthetic rubber to the Hycar Customer Service laboratory for development.

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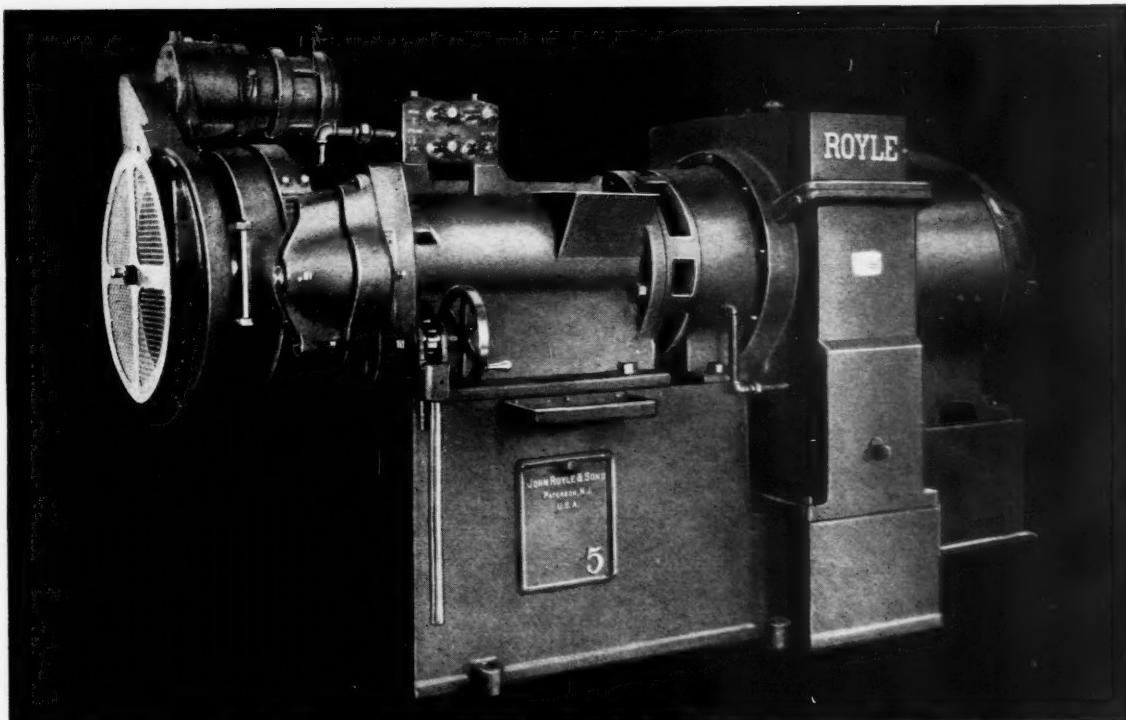
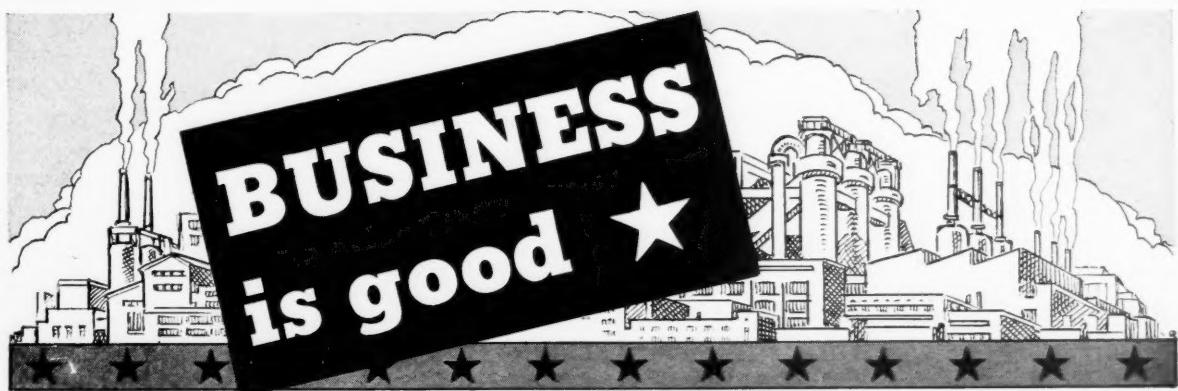
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Percentage elongation.....	490	515
Specific gravity.....	1.626	1.430

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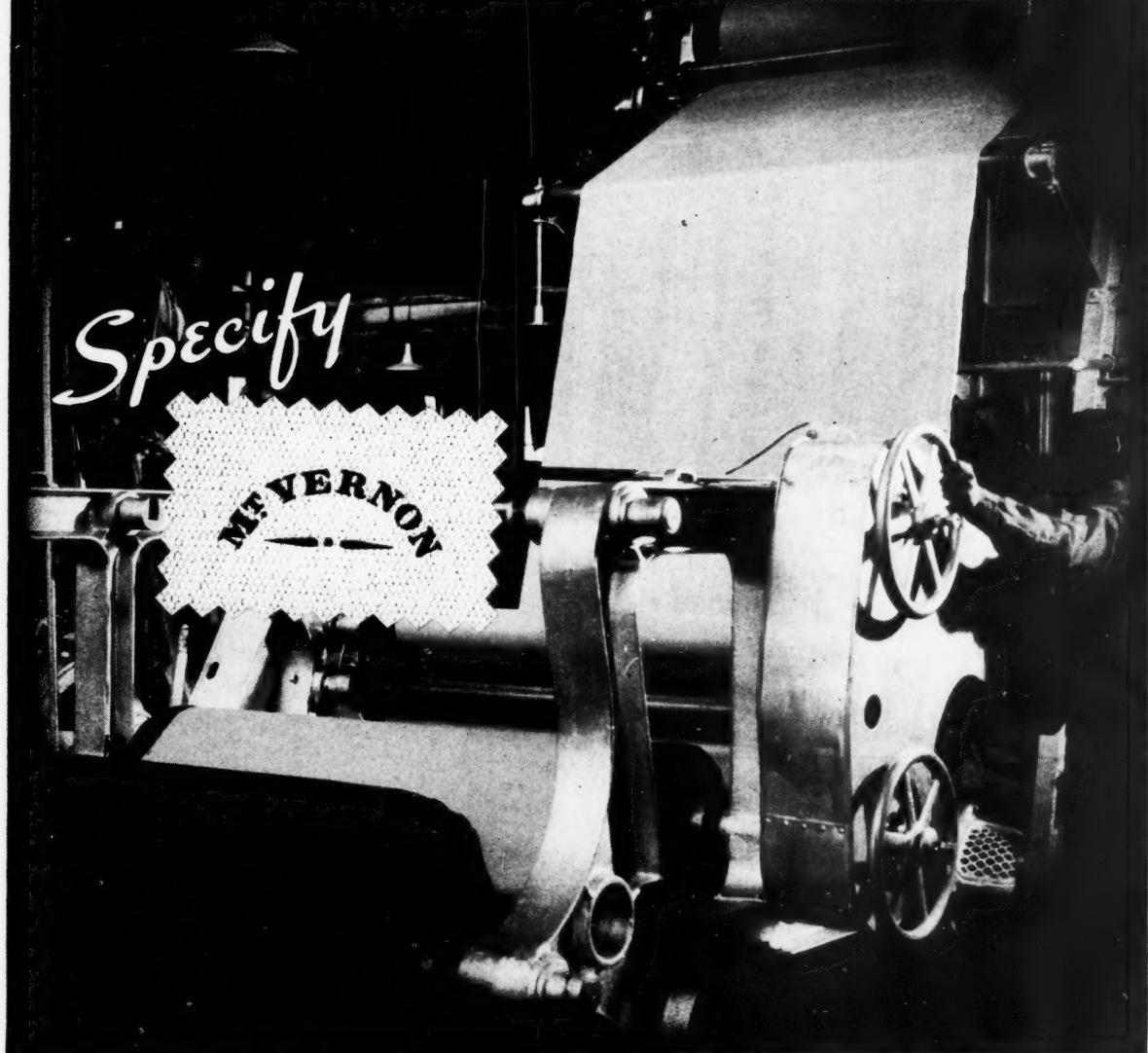
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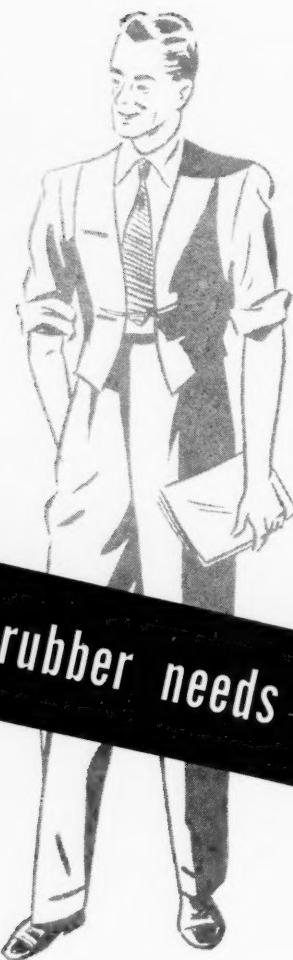
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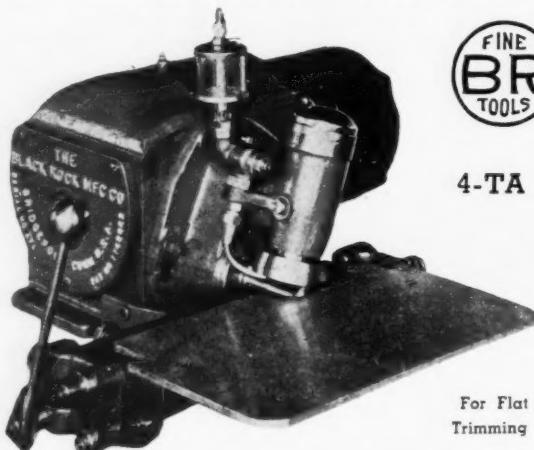
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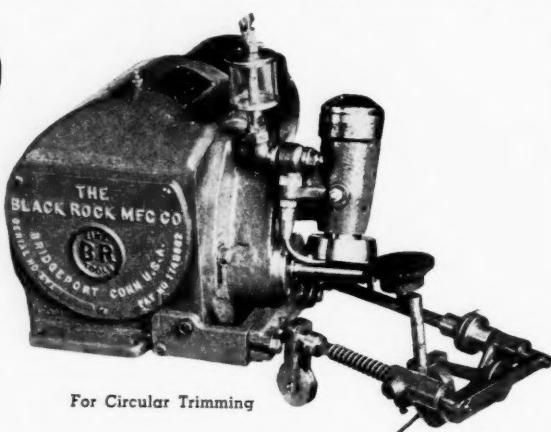
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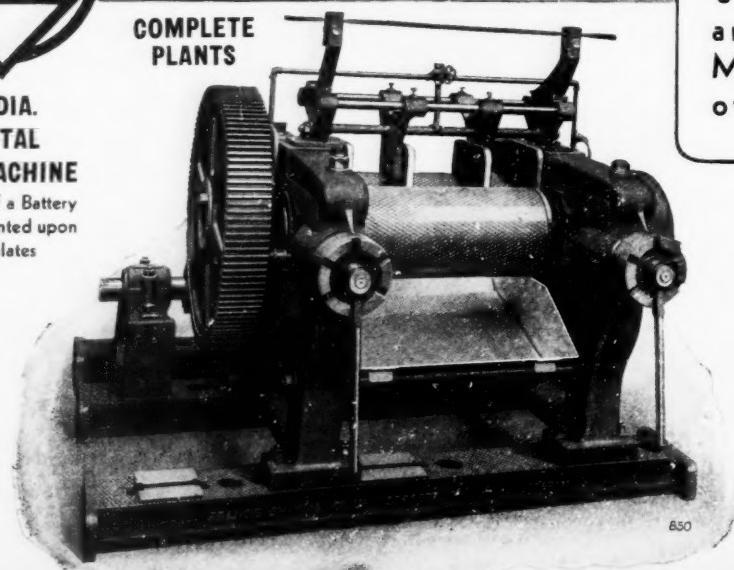


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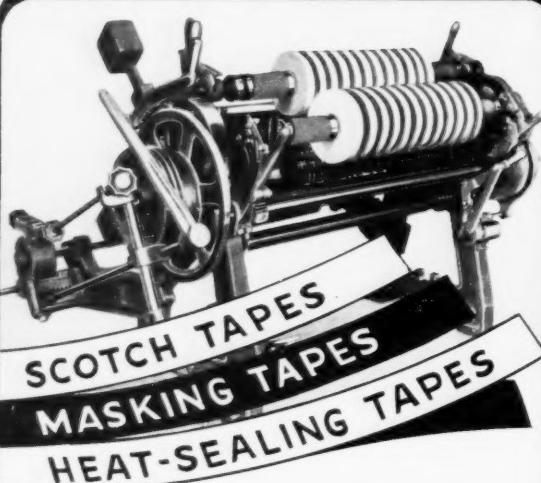
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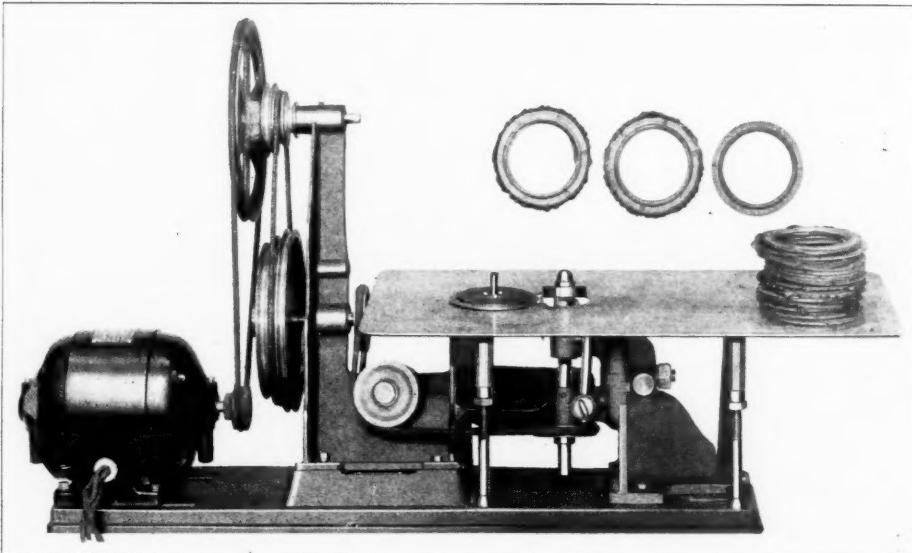
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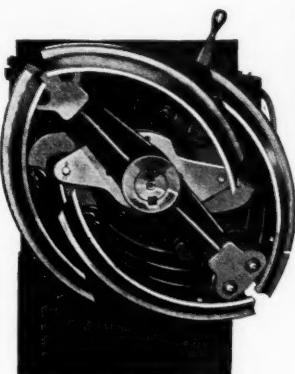


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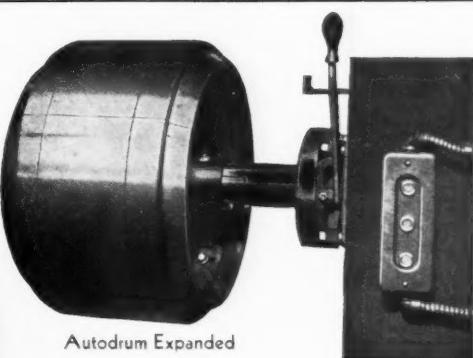
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VOLUME 107

NUMBER 5

A Bill Brothers Publication

INDIA RUBBER WORLD

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Volume 107

New York, February, 1943

Number 5

The Compounding of Guayule Rubbers¹

THIS paper is the third in a series of reports on the compounding of guayule rubbers. The previous papers² dealt with the effects of accelerator-curing agent combinations on the properties of stocks prepared from *Hevea* rubber and three guayule rubbers, each of different resin content. The purpose of the present paper is mainly to show data on the effects of rubber breakdown and temperature of cure on the tensile strengths of guayule stocks and similar *Hevea* stocks and to present the results of a study of the effects engendered in guayule stocks and similar *Hevea* stocks by variation in their content of stearic acid.

Hauser and le Beau³ recently published an interesting paper describing the results of experiments on guayule rubber. The experiments were conducted in order to determine the effects of breakdown temperature, curing temperature, and stearic acid content on the tensile strength-time of cure relation of a pure-gum stock prepared from commercial deresinated guayule rubber. These investigators concluded that "—guayule rubber may not be processed, compounded, or vulcanized by standard *Hevea* rubber methods if maximum physical properties are desired, and that with appropriate compounds, commercially deresinified guayule can result in cured stocks which are equivalent in their physical properties to those which are prepared from *Hevea* rubber."

Inasmuch as it is the desire of all rubber manufacturers to obtain maximum physical properties from the crude rubber which they use, it is important to evaluate carefully the accepted methods for processing and vulcanizing *Hevea* rubber with regard to their applicability to guayule rubber. Accordingly the authors have repeated several of the experiments of Hauser and le Beau. In some cases very similar recipes were used; in other cases recipes devised by the authors were used. In every case similar smoked sheet stocks were tested concomitantly for comparison.

Effect of Milling Temperature

The mill roll temperatures for the breakdown and mixing of *Hevea* stocks are generally kept as low as possible

¹ The opinions or assertions contained herein are the private ones of the authors and are not to be construed as official or reflecting the views of the Navy Department or naval service at large.

² INDIA RUBBER WORLD, 105, 565 (1942); 107, 31 (1942).

³ Ibid., 106, 447 (1942).

Effect of Various Factors on Physical Properties.....

Ross E. Morris,

Senior Rubber Technologist, Rubber Laboratory, Navy Yard, Mare Island, Calif.

Robert R. James,

Rubber Technologist, Rubber Laboratory, Navy Yard, Mare Island, Calif.

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Associate Rubber Technologist, Rubber Laboratory, Navy Yard, Mare Island, Calif.

Theodore A. Werkenthin,

Senior Material Engineer, Standards and Tests Section, Bureau of Ships, Navy Department Washington, D. C.

in factory practice, primarily to avoid scorching, secondarily to reduce the nerve of the rubber. The reduction in physical properties which might result from a low milling temperature is generally considered to be negligible.

A 6 by 13 laboratory mill with a friction ratio of 1.4 was employed for finding the effect of mill temperatures in this investigation. The authors recognize that this mill is a far cry from the large factory mills, but it is believed that the temperature effect will, if anything, be more pronounced with this mill than with a larger machine. The temperatures of the rolls on the laboratory mill were determined with a Cambridge surface pyrometer at the start and finish of the batches. The temperature of the rubber was determined by wrapping the stock around a thermocouple immediately after sheeting off.

TABLE I. RECIPES TESTED

	No. 1	No. 2	No. 3	No. 4
Rubber	100.0	100.0	100.0	100.0
Pelletex	50.0	—	—	50.0
Zinc oxide	5.0	5.0	5.0	5.0
Stearic acid	2.0	Variable	Variable	Variable
Captax	—	1.0	—	—
Altax	0.8	—	0.8	0.8
Methyl zimate	0.1	—	0.1	0.1
Sulphur	2.5	2.5	2.5	2.5

Recipe No. 1 in Table 1 was employed for the temperature tests. This recipe is believed to be representa-

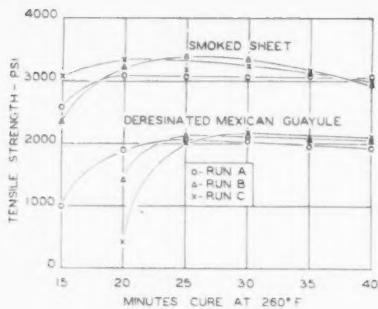


Fig. 1. Effect of Milling Temperature on the Tensile Strength-Time of Cure Relation for Loaded Smoked Sheet and Deresinated Mexican Guayule Stocks Containing Altax-Zimate Acceleration

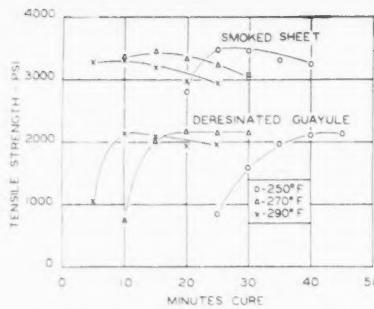


Fig. 2. Effect of Curing Temperature on the Tensile Strength-Time of Cure Relation for Loaded Smoked Sheet and Deresinated Mexican Guayule Stocks Containing Altax-Zimate Acceleration

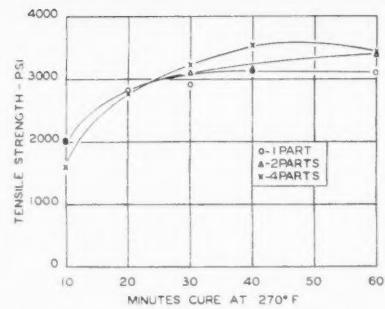


Fig. 3. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Smoked Sheet Stock Containing Captax Acceleration

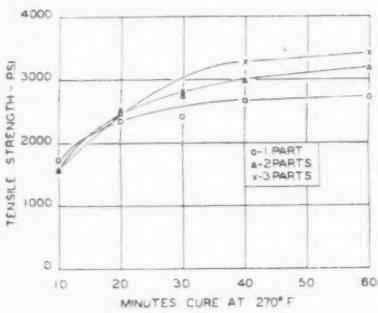


Fig. 4. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Deresinated Smoked Sheet Stock Containing Captax Acceleration

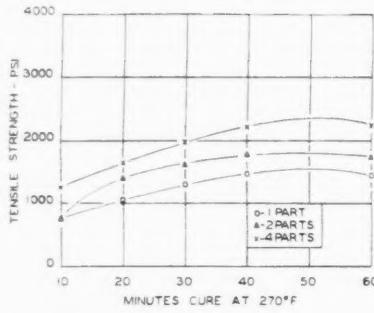


Fig. 5. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Deresinated Mexican Guayule Stock Containing Captax Acceleration

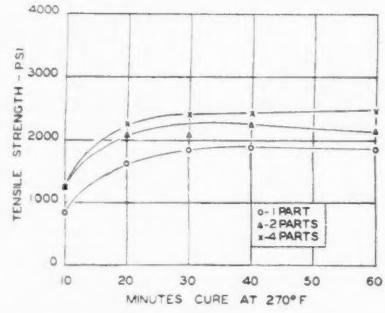


Fig. 6. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Domestic Deresinated Guayule Stock Containing Captax Acceleration; Lot No. 1

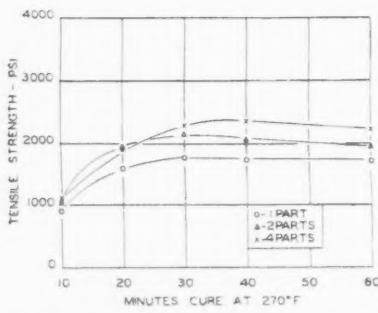


Fig. 7. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Domestic Deresinated Guayule Stock Containing Captax Acceleration; Lot No. 2

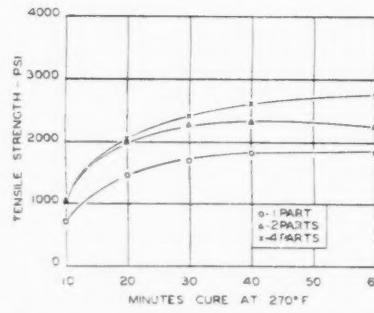


Fig. 8. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Domestic Deresinated Guayule Stock Containing Captax Acceleration; Lot No. 3

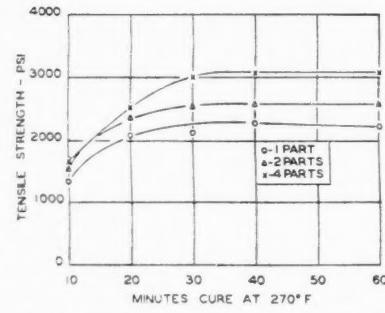


Fig. 9. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Domestic Deresinated Guayule Stock Containing Captax Acceleration; Lot No. 4

tive of a medium-hard mechanical goods stock. The deresinated Mexican guayule rubber was prepared by extracting the resiniferous rubber with acetone, then drying the extracted rubber at 160°F in a vacuum. The deresinated rubber contained 5.6% acetone-soluble material and 0.06% fibrous material (caught on a 100-mesh screen). The batch weight of each stock was 641.6 grams.

The total mixing time was 25 minutes, including a two-minute breakdown for the rubber. The mill opening was 0.058-inch. The test slabs were cured 24 hours after mixing. These specifications were strictly adhered to for all of the batches.

The average roll temperatures at the start and finish of each batch and the stock temperature at the finish of each batch are given in Table 2. The low, medium, and

high temperature runs for each rubber are designated as A, B, and C respectively. It will be noted that the A runs started at 75°F., the B runs at 158°F., and the C runs at 212°F. The tensile strength-time of cure relation for each batch is given in Figure 1.

TABLE 2. MILL ROLL AND STOCK TEMPERATURES
Smoked Sheet Batches

	Run A	Run B	Run C
Average roll temperature at start	75°F.	158°F.	212°F.
Average roll temperature at finish	121°F.	158°F.	220°F.
Stock temperature at finish	195°F.	160°F.	205°F.

Deresinated Mexican Guayule Batches

	Run A	Run B	Run C
Average roll temperature at start	75°F.	158°F.	212°F.
Average roll temperature at finish	95°F.	170°F.	210°F.
Stock temperature at finish	117°F.	154°F.	192°F.

The data plotted in Figure 1 show only a slight benefit

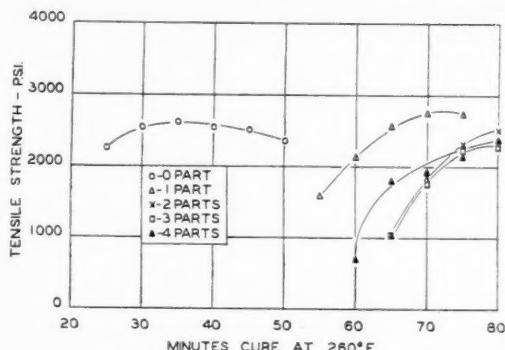


Fig. 10. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Deresinated Mexican Guayule Stock Containing Altax-Zimate Acceleration

for the higher milling temperatures; in fact the benefit is almost within experimental error. This is in directional agreement with data of Hauser and le Beau, but these investigators neglected to point out that the tensile properties of *Hevea* rubber are likewise affected to even a greater extent by milling temperature. They stated, moreover, that the milling temperature has no effect on the rate of cure of guayule rubber; whereas their plotted data indicate that the batch milled at the higher temperature cured slower. The authors found that the guayule batches milled at 158° and 212° F. cured considerably slower than the batch milled at 75° F.; the former batches did not cure in 15 minutes at 260° F.; while the latter batch reached a tensile strength of 1000 p.s.i. in this time.

Effect of Curing Temperature

The effect of curing temperature on tensile strength was found by curing the smoked sheet and deresinated guayule stocks, Recipe No. 1 in Table 1, for various times at 250°, 270°, and 290° F. The data are plotted in Figure 2.

It is evident that the curing temperature within the range 250-290° F. has little influence on tensile strength at optimum cure. There is a drop of about 200 p.s.i. in the optimum tensile values between the 250° F. cure and the 290° F. cure in the case of the smoked sheet stock. The deresinated Mexican guayule stock shows practically no change in optimum tensile values between these temperatures.

Hauser and le Beau found that lower curing temperatures favored higher optimum tensile strength. However they used unactivated Captax acceleration, which would not be expected necessarily to behave the same as Altax-methyl zimate acceleration.

Effect of Stearic Acid

Several years ago when the authors first started working with guayule rubber, they were advised by H. Boucher, then chemist for the American Rubber Producers, Inc., Salinas, Calif., that guayule rubber requires more stearic acid than *Hevea* rubber for satisfactory vulcanization. Hauser and le Beau investigated the stearic acid requirement of a pure-gum guayule stock accelerated with Captax and found that an increase from one part to four parts stearic acid raised the tensile strength at optimum cure about 1000 p.s.i. At the time of publication of these data the present authors were completing a comprehensive investigation of guayule rubber compounding in which variations in the proportions of accelerators, zinc oxide,

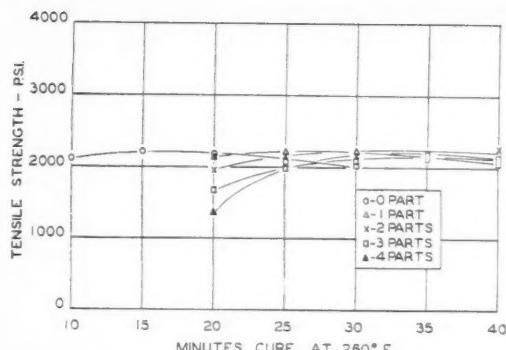


Fig. 11. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Loaded Dersinated Mexican Guayule Stock Containing Altax-Zimate Acceleration

stearic acid, and sulphur were studied. It had been found that, when using Altax-methyl zimate acceleration and a Pelletex loading, the presence of stearic acid is not required for optimum tensile strength. It was therefore decided to repeat the work of Hauser and le Beau to find whether the requirement for high stearic acid is peculiar to a pure-gum guayule stock accelerated with Captax.

The pure-gum recipe used to determine the effect of stearic acid is No. 2 in Table 1. This recipe is similar to the recipe employed by Hauser and le Beau except that the sulphur has been reduced from 3 parts to 2.5 parts. Batches were prepared containing the rubbers listed in Table 3. The stearic acid proportions used with each rubber were one part, two and four parts. The tensile strength of the stocks after curing for various times at 270° F. are plotted in Figures 3 to 9 inclusive.

TABLE 3. RUBBERS USED FOR DETERMINING EFFECT OF STEARIC ACID

Rubber	Deresinated by	Content of Acetone-Soluble Material %	Content of Fibrous Material %
Smoked sheet	Rubber Laboratory	5.1	0.0
Deresinated smoked sheet	Rubber Laboratory	1.6	0.0
Deresinated Mexican guayule	Rubber Laboratory	5.5	0.48
Deresinated domestic guayule, lot No. 1	American Rubber Producers	4.4	0.13
Deresinated domestic guayule, lot No. 2	American Rubber Producers	6.2	0.13
Deresinated domestic guayule, lot No. 3	American Rubber Producers	3.1	0.11
Deresinated domestic guayule, lot No. 4	American Rubber Producers	3.2	0.06

It is evident from the plotted data that the tensile strength of all the rubbers is improved by increasing the proportion of stearic acid to four parts. The improvement is about equal for the deresinated guayule rubbers and deresinated smoked sheet. The improvement is somewhat greater for deresinated smoked sheet than for resiniferous smoked sheet. It is clear, nevertheless, that the improvement in tensile strength resulting from increased stearic acid is a characteristic not only of a pure-gum deresinated guayule stock accelerated with Captax, but also of a similar smoked sheet stock.

The fact that a pure-gum *Hevea* stock accelerated with Captax will reach its highest tensile strength when four parts of stearic acid are used has been known for some time.⁴ The reason that this much stearic acid is not generally used in such a stock is the undesirable bloom of stearic acid which may develop before and after cure. The same reason would apply against using four parts of stearic acid in a pure-gum deresinated guayule stock.

Previous work² has shown that Altax activated by methyl zimate is an outstanding accelerator combination for use in guayule stocks. This accelerator combination produces excellent physical properties and good resist-

⁴ Vanderbilt News, 3, 4, 26 (1933).

Fig. 12. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Pure-Gum Smoked Sheet Stock Containing Altax-Zimate Acceleration

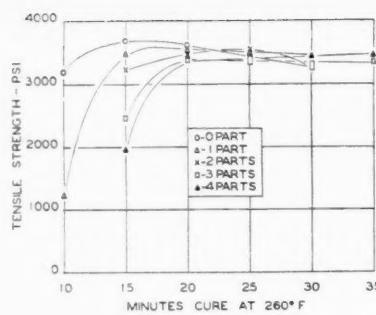
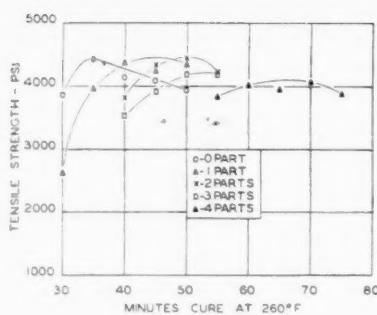


Fig. 13. Effect of Stearic Acid on the Tensile Strength-Time of Cure Relation for a Loaded Smoked Sheet Stock Containing Altax-Zimate Acceleration

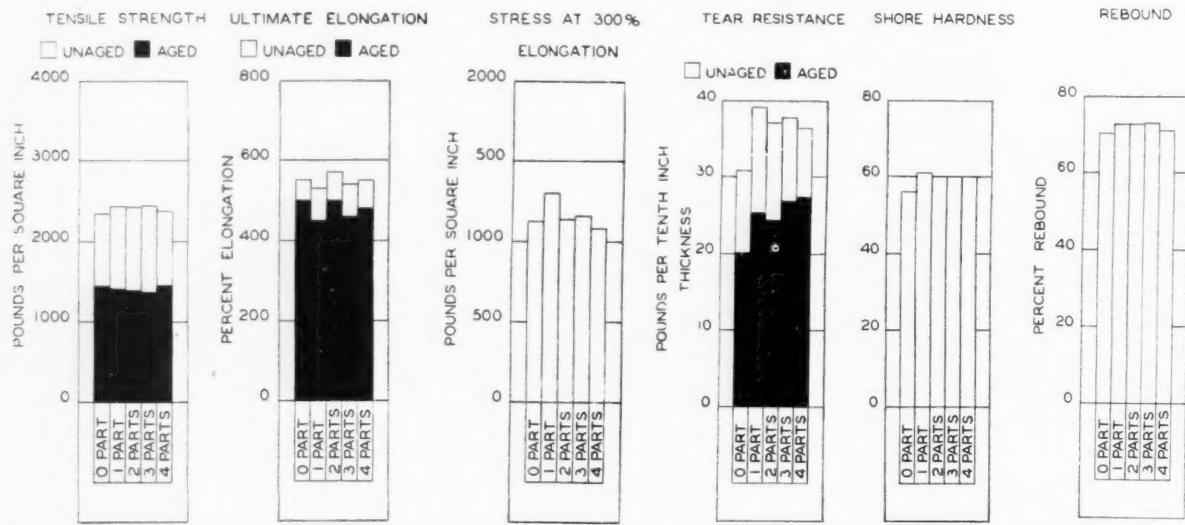


Fig. 14. Effect of Stearic Acid on Various Physical Properties. Loaded Mexican Deresinated Guayule Stock. Altax-Methyl Zimate Acceleration.

ance to accelerated aging and natural weathering. The authors, therefore, were interested in finding the effect of stearic acid in guayule stocks containing this accelerator combination. A pure-gum recipe and a recipe containing Pelletex were employed for this purpose. These recipes, Nos. 3 and 4, respectively in Table I, were tested without stearic acid and with one part, two, three and four parts stearic acid. The deresinated Mexican guayule rubber used in these recipes is described in Table 3. The same recipes were used for compounding smoked sheet stocks, which were tested for comparison.

The curves showing tensile strength versus time of cure at 260° F. for the above stocks are presented in Figures 10, 11, 12, and 13. These curves show that the addition of stearic acid to the guayule and smoked sheet stocks accelerated by Altax and methyl zimate does not improve their tensile strength at optimum cure, but does reduce their rate of cure. The reduction in rate of cure is more pronounced with the guayule stock than with the smoked sheet stock and is more pronounced with the pure-gum stocks than with the loaded stocks.

Further information on the effects of stearic acid in the loaded guayule stock, Recipe No. 4, was obtained by conducting the following tests on the optimum cure for each stock: oxygen-bomb aging, tear resistance, Shore hardness, and rebound. The oxygen bomb aging test consisted of aging A. S. T. M. type C tensile-strength specimens and A. S. T. M. type B tear-resistance specimens for 24 hours at 158° F. under 300 p.s.i. oxygen pressure. The rebound test was performed with the Goodyear-Healy pendulum using a 15-degree angle of fall. The initial and aged tensile strengths, ultimate

elongation, stress at 300% elongation, initial and aged tear resistance, Shore hardness, and rebound are presented in the form of bar graphs in Figure 14.

Figure 14 shows that increasing the stearic acid content from none to four parts does not improve initial tensile strength, aged tensile strength, ultimate elongation or stress at 300% elongation. The addition of one part stearic acid however, slightly improves initial tear resistance, aged tear resistance, Shore hardness, and rebound. Increasing the stearic acid above one part brings about no further improvement in any of these properties. It is concluded, therefore, that one part or two parts of stearic acid should be used in deresinated guayule stocks containing Altax-methyl zimate acceleration and Pelletex loading if the slower rate of cure resulting therefrom is not objectionable.

Effect of Other Ingredients Involved in Vulcanization Reaction

It was believed desirable to investigate variations in the amounts of the other compounding ingredients which are involved in the vulcanization reaction: namely, zinc oxide, Altax, methyl zimate, and sulphur. This was done in Recipe No. 1, using the deresinated Mexican guayule rubber described in Table 3. Only one ingredient was varied at a time. The following variations were tried:

Zinc oxide	2.5-5.0-10.0 parts
Altax	0.8-1.0-1.2 parts
Methyl zimate	0.1-0.15-0.2-0.25 parts
Sulphur	2.5-2.75-3.0-3.5 parts

The underlined figures are the proportions of the respective ingredients contained in the base recipe.

The various stocks were tested for initial tensile strength, aged tensile strength, ultimate elongation, stress at 300% elongation, initial tear resistance, aged tear resistance, Shore hardness, and rebound. The test results showed that none of the variations was an improvement over the base recipe. The differences in properties were so slight in most cases that it is not considered worthwhile to present the data.

Quality of Deresinated Guayule Rubber

Hauser and le Beau³ have stated that with appropriate compounds, commercially deresinated guayule rubber can result in cured stocks which are equivalent in their physical properties to those prepared from *Hevea* rubber. The authors doubt that this equivalence can be regularly obtained with the deresinated guayule rubbers commercially available. In support of this contention reference is again made to Figures 3 to 9 inclusive. It is shown in these graphs that stocks prepared from four commercially deresinated guayule rubbers have optimum tensile

strengths ranging from 2300 p.s.i. to 3100 p.s.i.; whereas the smoked sheet stock has an optimum tensile strength of 3500 p.s.i. It is evident that the commercially deresinated guayule rubbers now available vary widely in quality and usually are considerably lower in quality than first-grade *Hevea* rubber.

Conclusions

The authors conclude from the work reported herein that the deresinated guayule rubber commercially available may best be compounded in the same manner as *Hevea* rubber, with an expectation of obtaining approximately 75% of the tensile strength of a similar *Hevea* stock. It is further concluded that deresinated guayule rubber may generally be processed and cured in the same manner as *Hevea* rubber without sacrificing quality to a greater extent than is done with *Hevea* rubber.

The authors wish to acknowledge the cooperation of Irwin H. Whitthorne and Harold N. Olsen in this investigation.

Rubber Mill Power Transmission Comparison

IN AN effort to make perfectly clear the efficiency differences that commonly exist between belt and electric power transmission in rubber mills, the sketches herewith have been prepared. As shown at the top in Figure 1, the overall efficiency of a belt drive is commonly 95%. By careful alining, ball bearings, using high-grade belts, etc., efficiencies even higher than 95% are obtained, but 95% is used here because it is no exaggeration. Below that sketch, Figure 1, a generator and motor-drive combination is shown. If the efficiency of the generator is 90% and that of the motor also 90%, the overall efficiency (0.90×0.90) is 81%. If the efficiency of your generator or motor is higher or less than 90%, substitute the efficiency of your own equipment and then compare with the 95% overall efficiency of belt transmission.

Figure 2 shows that where one has four "re-drives", with the efficiency of each 95%, the overall efficiency ($0.95 \times 0.95 \times 0.95 \times 0.95$) is 81%. In such a case the efficiency of electric transmission, using 90% for both gen-

erator and motor, is just as high as the overall belt transmission.

Keep the number of intermediate shafts down to the very minimum. "Intermediate shafts" means the number of shafts between the driving machine, whatever it may be, and the driven machine. The reason why "re-drives" are inefficient is shown in Figure 3. Thus where the efficiency of the single drive is 90%, and where there are three intermediate shafts, the overall efficiency drops from 90% to 65%, as depicted by the top curve. The other curves show what happens when the unit efficiencies are 80%, 70%, 60%, and 50% respectively. Conditions grow worse and worse. With a unit efficiency of 50% the overall efficiency with three intermediate shafts drop to 6%.

This chart makes it obvious why the efficiency of each unit drive should be kept as high as possible. Thus if 100% were possible, the overall efficiency even with three intermediate shafts would still be 100%. But perfect transmission, of course, is impossible.

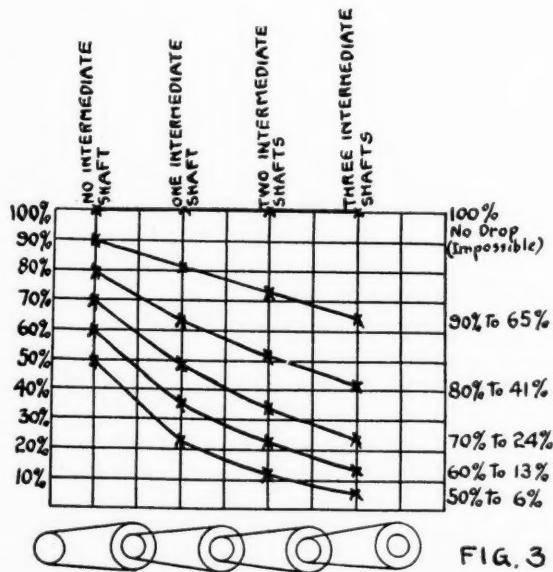
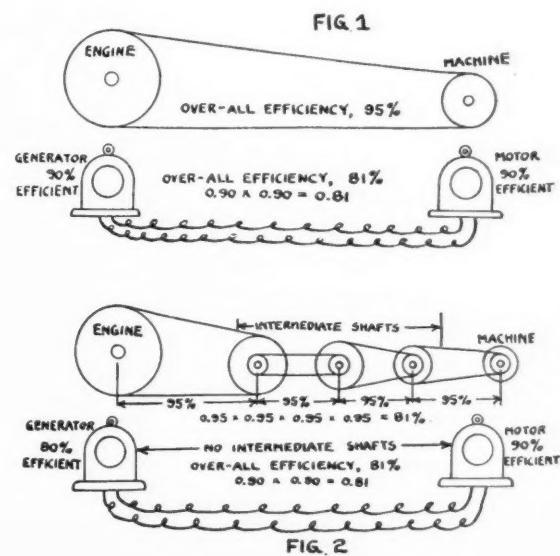


FIG. 3



The pH, Surface, and Structure of Colloidal Carbons¹

THREE fundamental and critical properties of colloidal carbons are now recognized as governing the behavior of these carbons in rubber compounds. These "building stones," necessary requirements in the theory and practice of carbon reenforcement, are, in the order of their discovery,

pH	in 1937
Surface Area	in 1940
Structure	in 1941

pH. The pH properties of colloidal carbon were first discussed in a paper from these Laboratories in 1937² in which it was shown that the pH change produced by colloidal carbon is an adsorptive phenomenon in which the selective adsorption of any carbon varies as some function of its volatile matter. Subsequent investigations³ revealed that this pH effect is most intimately tied up with the oxygen of the volatile matter, particularly that portion which on deactive heating of the carbon is removed as CO₂. The selective adsorption by the carbon colloid for accelerators, particularly of the alkaline type, in rubber compounds led to cure disturbances and the description of colloidal carbons as quick or slow vulcanizing. Subsequently⁴ it was pointed out that the best guide to this "rate of vulcanization" characteristic of rubber carbons is their pH value.

SURFACE AREA. Accurate particle size, shape, and surface area values were first reported for Micronex carbon in 1940,⁵ the results based on investigations with the electron microscope. Similar values for other members of the colloidal carbon family or "spectrum" followed in 1942.⁶ These results aided greatly in lifting the veil from the mystery of colloidal carbon-rubber reenforcement.

The role played by surface area in natural rubber compounding, and other chemical and physical properties, has been examined. Surface area was revealed as the dominating influence in the tintorial properties of color and tinting strength, in such colloidal properties as thixotropy and bound rubber, and in the rubber properties of energy, tensile, Shore hardness, and rebound. The mineral oil color and rebound versus surface area relations were found most consistent, hence permitting the use of these properties as a fairly accurate, indirect measure of particle size and surface. The "flattening" of the tinting strength and energy versus surface area curves, beyond the eight-acre carbons (Statex), is ascribed to less availability of surface for carbons that are finer than eight acres.

The role of surface area thus stands revealed as dominant in colloidal carbon-rubber reenforcement theory and practice, subject, however, to important and sometimes controlling anomalies. These are shown to be largely resolved on the assumption that carbon structure, in addition to surface area, plays an important role.

C. W. Sweitzer² and H. A. Braendle²

CLASSIFICATION OF RUBBER CARBONS						
Type	Carbons	Action in Rubber	Rubber Compounding Properties	Tintorial Properties	Colloidal Properties	
I	Carbon Black	Form Reenforcing "Carbon-Rubber" Complexes	Normal Reinforcement extent of which governed by Specific Surface of carbon.	Normal trend. Strength rising to maximum. Color rising continuously. Reinforce "active" vehicles in proportion to specific surface.	Density, Sed. Volumes, Oil and H ₂ O absorption and Bound Rubber essentially normal i.e., follow surface values.	
	Statex					
II	Acetylene Black	Form both "Carbon-Rubber" (C-R) and "Carbon-Carbon" (C-C) Complexes	Energy and tensile low due to C-C complexes interfering with C-R complexes	Strength low (acetylene). Color normal. Always form matte or dull surfaces in inks and paints. Surface of torn rubber duller than Types I and III.	Density low. Sed. Volume high. Liquid absorptions high due to carbon-carbon net work.	
	Lamp-black		Raw plasticity and loading capacity low, also Modulus and hardness high—due to additive effect of C-C and C-R complexes.	Electrical anisotropy and conductivity high.		
III	Fine Thermal	Inactive—form no complexes	Primary action dilution, but tensile strength improved by fine thermal carbon via plastic film mechanism.	Strength and color normal for particle size.	Density high. Sed. Volume low. Liquid absorptions low. Bound Rubber low carbon surface inactive.	
	Coarse Thermal			Inactive to all vehicles.		

STRUCTURE. In the properties just considered the anomalously high values for acetylene carbon and lamp-black in Shore hardness of rubber compounds containing these blacks and the anomalously low values in apparent density of the blacks are now ascribed⁷ to the presence of "structure" in these carbons. This structure is defined as a more or less rigid or permanent carbon network system. The network structure of these carbons is confirmed by electron photomicrographs.

In such properties as sedimentation volume, water and oil absorption, rubber absorption (reciprocal of plasticity) and modulus, structure is revealed as the dominating influence, rather than surface. These carbons possess, in addition to strong carbon-carbon bonds, normal carbon-rubber bonds as evidenced by their reenforcement of rubber. Interference of the carbon-carbon complexes with the carbon-rubber complexes tends, however, to reduce energy and tensile values below those expected on the basis of surface.

Reenforcing carbons such as Furnex, Statex, and Micronex are normal in the properties discussed; that is, they behave as anticipated on the basis of their surface area. They reenforce normally, so possess normal carbon-rubber bonds. They show normal modulus, so possess normal carbon-carbon bonds, but not "structure." These carbons are revealed by the electron microscope as showing an aggregated or agglomerated condition rather than a more rigid network system. Such aggregation can under the proper conditions be milled out in rubber; whereas the network "structure" resists such dispersion.

(Continued on page 476)

¹ Presented at the meeting of the Boston Group, Rubber Division, A. C. S., Dec. 16, 1942.

² Columbian Carbon Co., Research Laboratory, New York, N. Y.

³ *Ind. Eng. Chem.*, 29, 953 (1937).

⁴ "Columbian Colloidal Carbons," Vol. III, 64, 67 (1942).

⁵ "Proceedings of the Rubber Technology Conference, 1938," pp. 484-505, London, 1938.

⁶ "Columbian Colloidal Carbons," Vol. II (1940).

⁷ *Can. Chem. & Proc. Ind.*, Nov., 1941, pp. 579-81.

⁸ Unpublished work of Columbian Carbon Laboratories.

Carbon Black in All-Reclaim Tire Treads

ALARGE number of civilian tires may be manufactured from 100% reclaim in the next few months. The question as to what type of channel carbon black is best suited for the treads of these tires is, therefore, of immediate importance. Since, as a result of the synthetic rubber program, we are faced with the possibility of a shortage of channel blacks, it may also be of interest to ask whether standard channel black, which can be produced in higher yields, will not do so satisfactory a job as the currently more popular, lower yield soft channel blacks. A switch to standard channel black wherever possible will save carbon black producing capacity and thus may postpone or even make unnecessary the expenditure of thousands of tons of steel which would be required to create additional channel plant capacity. The information contained in this study is directed toward shedding some light on these questions.

Formulation and Test Conditions

In the following tests Xylos whole-tire reclaim #3611 was used. The analysis of this material is given by the manufacturer as:

	Parts per 100 Rubber
Rubber hydrocarbon	55.19
Carbon black	17.22
Ash	13.86
Acetone extract	10.49
Total	96.76
	175

The laboratory test formulation used was:

	Parts per 100 Rubber
Reclaim	175.00
Captax	0.50
DPG	0.20
Stearic acid	2.00
Zinc oxide	4.00
Carbon black	29.00
Sulphur	3.25

The total carbon black loading in the above is 60 parts by weight per 100 parts rubber hydrocarbon.

Milling was done on a cold ten-inch laboratory mill, using as short a mill-time as possible and adding the ingredients in the order in which the formula is given. The stock was allowed to cool for five minutes between the addition of the carbon black and the sulphur. Curing was done at 287° F., and tests were carried out under standard rubber testing conditions except where otherwise indicated.

Grades of Black Used

TABLE I. PROPERTIES OF THE BLACKS

Continental Grade	Type	Color Index	DPG Adsorption*	Iodine Adsorption†	Estimated Average Matter‡	Particle Diameter (μ)	Yield	Average	
								%	%
AAA	Extra soft channel black	55	33	44	5.0	35	Very low		
AA	Soft channel black	60	33	46	4.8	33	Low		
A	Standard channel black	85	40	49	3.5	26	Normal		
D	Standard channel black	80	50	47	5.5	25	Optimum		
F	Standard channel black	92	51	50	5.8	23	Normal		
G	Harsh channel black	100	48	54	4.5	20	Normal		
C-15	Extra-harsh channel black	130	45	64	3.6	17	Low		

*F. H. Amon and R. K. Estelon, *Ind. Eng. Chem.*, 24, 579 (1932).
†% Iodine adsorbed by 1 gm. black (to which 10 cc. of 10% H₂SO₄ have been added) from 100 cc. of iodine solution in KI containing 2.7 gm. I₂ and 4.05 gm. KI per liter of solution.

‡C. R. Johnson, *Ind. Eng. Chem.*, 25, 994 (1933).

The blacks tested are listed in Table I. They may be

1 Research laboratory, Continental Carbon Co., 6130 W. 51st St., Chicago, Ill.

L. H. Cohan¹ and J. F. Mackey¹

considered representative of the range of channel carbon blacks used in rubber.

The color index and iodine adsorption for each of the blacks are given as well as the approximate particle diameter. Both the color and iodine adsorption values are a rough measure of the surface area.

Also given in Table I are the relative yields obtained in producing these blacks from a stripped natural gas consisting of about 10-15% N₂, 84-89% CH₄ and 1-2% higher hydrocarbons.

Effect of Black on Rubber Tests

The rubber test data are given in Table 2. The optimum cure for all stocks is about 45 minutes. In some cases (e.g., hardness, aging, rebound) only optimum or representative results are given in order to conserve space. Some of the test results have been plotted against particle size in Figures 1 and 2.

TABLE 2. EFFECT OF VARIOUS BLACKS IN WHOLE-TIRE RECLAIM TREAD STOCK

	Original Test Results Modulus at 200°C. Elonga- tion (psi)	Cure Time (Min.)	Blacks Used					
			AAA	AA	A	D	F	G
Tensile at Break (psi)	10 650 700 600 600 700 700 650							
	20 950 850 950 900 900 800 900							
	30 1100 1000 1100 1100 950 1000 950							
	45 1150 1100 1100 1100 1050 1100 1000							
	60 1150 1100 1150 1150 1050 1150 1050							
Tensile at Break (psi)	10 1200 1350 1300 1300 1350 1300 1300							
	20 1550 1600 1600 1700 1650 1550 1650							
	30 1700 1750 1800 1750 1700 1700 1700							
	45 1750 1750 1800 1700 1700 1650 1650							
% Elongation at Break	10 360 380 400 395 365 345 375							
	20 345 390 360 380 385 355 350							
	30 325 350 345 320 340 340 375							
	45 310 315 325 305 335 330 365							
	60 310 300 305 285 325 310 340							
Tear* (lbs./in.)	30 360 360 375 390 375 375 375							
	45 310 360 350 310 375 310 375							
Results After O ₂ Aging†								
Tensile @ Break (psi)	45 1400 1350 1450 1400 1250 1400 1350							
% of Original Tensile	45 80 77 80 82 71 82 82							
% Elongation @ Break	45 195 200 215 210 190 215 260							
Shore Durometer @ 25°C.	45 65 65 66 65 66 67 66							
Shore Durometer @ 100°C.	45 57 57 58 58 59 59 58							
% Rebound‡ @ 25°C.	45 25 25 24 24 24 23 23							
% Rebound‡ @ 100°C.	45 50 50 49 48.5 48.5 49 46							
Blowout § Time	45 14'57" 14'28" 15'10" 14'41" ... 14'41" 15'36"							
Blowout § Temp. (° F.)	45 233 236 238 233 234 234 232							
Heat Build-up ¶ (Temp. Rise—° F. in 25')	45 78 80 76 79 78 80							
Abrasion Loss# (cc./hp-hr.)	40 ... 214 262 258 ... 295 283							
	60 203 238 245 235 253 238 276							
	80 216 250 243 276 278 290 311							
Plasticity**	... 241 243 251 253 268 305 289							
Extrusion†† (sec.)	11.0 13.5 15.0 18.0 20.0 23.5 23.0							

* Crescent method.

† Aged 16 hrs. in bomb at 50 psi oxygen pressure and 80°C.

‡ Bashore.

§ Goodrich flexometer @ 0.200-inch stroke and 24.25 pounds load.

¶ Goodrich flexometer @ 0.125-inch stroke and 24.25 pounds load.

** Grasselli abrader using Norton Crystolon wheel (#3746-15).

†† Williams plastometer; final height in inches.

¶ Firestone-Dillon extruder at 10 pounds diaphragm pressure and 190°F. thermostat temperature.

(1) STRESS-STRAIN BEHAVIOR. Modulus, tensile, and elongation are about the same for all of these blacks. Grade A appears to have a slightly higher maximum tensile.

(2) TEAR RESISTANCE. For the 30-minute cure all samples are essentially the same. For the 45-minute cure some differences occur, but the results do not show any trend.

(3) RESISTANCE TO AGING. No appreciable difference

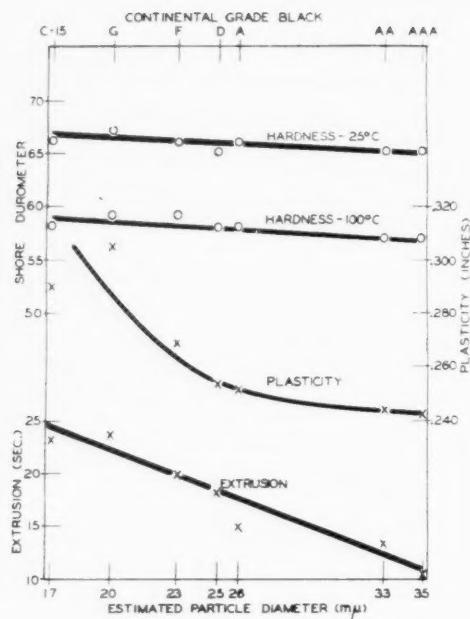


Fig. 1

is shown in any of these stocks. Stocks were aged according to the modified oxygen bomb technique at 80° C. and 50 psi pressure instead of 70° C. and 300 psi. Results reported are for a 16-hour aging period.

(4) HARDNESS. As shown in Figure 1, there appears to be a slight tendency for the Shore durometer reading to decrease as the particle size of the black increases. Since many uses for rubber involve temperatures well above 25° C., hardness has also been determined at 100° C. Relative results at the higher temperature are in agreement with the 25° C. measurements.

(5) RESILIENCE. Resilience measured as the per cent. rebound on a Bashore resiliometer shows a tendency to increase as the particle size of the black increases. This trend is shown at both 25° C. and 100° C., as can be seen in Figure 2.

(6) HEAT DEVELOPMENT. The conditions used in the blow-out and heat build-up tests are much less severe than commonly used in testing rubber stocks. The blow-out test was made with a Goodrich flexometer, using a 0.200-inch stroke and 24.25-pound load. In testing rubber stocks the conditions used are 0.250-inch stroke and 48.5-pound load. The same machine was used for heat build-up tests with 0.125-inch stroke and 24.25-pound load, which compares with 0.175-inch stroke and 24.25-pound load for rubber. No marked trend is shown, and very little difference between the blacks was found in blow-out time, blow-out temperature, or heat build-up. Blow-out time and heat build-up results are shown graphically in Figure 2. The decrease in blow-out time in going from C-15 to Grade G may be due to poorer dispersion of the former black. In this connection the extrusion and plasticity results are worth noting. C-15 actually gives a more plastic stock than Grade G; this result likewise may be due to less perfect dispersion in the case of C-15.

(7) ABRASION LOSS. Our experience has been that a single abrasion test on the Grasselli abrader may be in error by as much as 40% and therefore is only of value in revealing very large differences in abrasion resistance. The minimum abrasion loss of a series of three cures at optimum, optimum plus 50%, and twice optimum cure

time is more accurate, being dependable within about 20%. These minimum values are underlined in Table 2. The abrasion loss for these stocks is essentially the same for most of the blacks. Grades AAA and AA appear to show slightly lower loss figures.

(8) PLASTICITY AND EXTRUSION. The results indicate that AAA and AA are easier processing than the smaller particle size of blacks. On the basis of the Williams plastometer, A and D give stocks not very much less plastic than AAA and AA; however, Firestone-Dillon extrusion values show larger differences, as is indicated in Figure 1.

(9) ELECTRICAL RESISTANCE. Specific resistance was determined on a tensile sheet placed between brass electrodes under 36 psi pressure. All stocks showed a resistance greater than 10^{10} ohm-cm. except C-15; this stock had a measured specific resistance of 3×10^8 ohm-cm. Since the apparatus used will not measure resistances greater than 10^{10} ohm-cm. the relative conductivity of these stocks could not be determined. However, were a more sensitive apparatus used, specific resistance would probably decrease as the particle size of the black decreases.

Tests on Continental A and five other commercial soft channel blacks, and Continental AAA and one other commercial extra-soft channel black were in line with the results given in this study and showed all blacks to be either identical or very similar in all tests except extrusion. The Firestone-Dillon extrusion values in seconds for these commercial blacks are given in Table 3.

TABLE 3

Extra-Soft Channel		Soft Channel Blacks					
AAA	10.8	1	2	3	4	5	
	11.6	15.0	13.5	12.9	17.4	13.9	14.1

Conclusions

Except for plasticity as indicated by the Firestone-Dillon extruder, there is little difference between the behavior of soft and certain of the standard channel blacks in all-reclaim stocks. This fact is not surprising when it is remembered that reclaim already contains over 30 parts car-

(Continued on page 479)

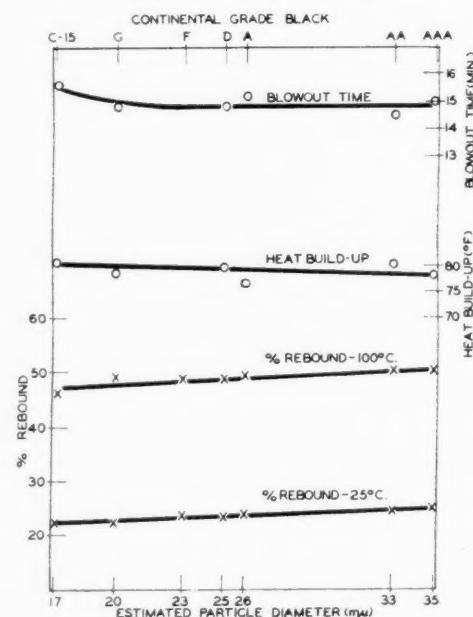


Fig. 2

Preliminary Evaluation of Falkomer in Certain Buna N Stocks

G. A. Schroeder

FALKOMER is a newly developed rubber-like compounding material. The possibility of replacing a part of the hydrocarbon in synthetic rubber compounds with this new material is indicated by the data. It can be obtained in two forms, solid or liquid, with slightly different properties characteristic to each. The question of which of the two forms to use can best be decided by the compounder who has his particular problem in mind. The article shows briefly the properties of certain Buna N-Falkomer stocks and suggests means to accomplish an extending action with minimum sacrifice of physical properties.

Composition and Properties

Falkomer 106 is described as a copolymer of coal-tar derivatives and polyesters of unsaturated fatty acid triglycerides so treated as to render the two otherwise incompatible ingredients compatible. As indicated by its dienic value, it is capable of further polymerization and/or vulcanization. It is a viscous, sticky liquid of sp. gr. 1.05, and it has a definite plasticizing effect on Buna N before vulcanization.

Falkomer 108 is a partially vulcanized elastic solid derived from a base quite similar to Falkomer 106. Its principal difference from Falkomer 106 lies in its solid state, and less pronounced plasticizing and tackifying properties before vulcanization.

In brief Falkomer 106 shows a slightly better extending action, but the 108 is somewhat easier to handle.

Compounding and Processing

Both types of Falkomer are compatible with the synthetics up to equal proportions, but for best extending action and physical properties not more than a 25% replacement is recommended. There may be cases, however, where tensile properties may not be so important as taking advantage of the softening and tackifying effect of Falkomer when used in larger quantities. In this connection mill mixes containing 50% Falkomer in Buna N and re-claim have been handled successfully.

Falkomer can be added any time after the initial breakdown of the synthetic; the only precaution is not to add it so fast that the batch goes to the back roll. It will be found that Falkomer added with the black increases the rate of addition and at the end, characteristics of better dispersion can be observed in the freshly cut stock.

Falkomer was observed to assist in the processing of Buna N by making a less "nervy" stock.

If sticking should be experienced in the case of a very soft stock five to ten parts of aluminum stearate will usually solve the difficulty.

Sulphur should be used on the total of synthetic and Falkomer and for best physical properties should be increased as the amount of Falkomer is increased. In some cases it has been found that an increase of 0.05-part sulphur per part Falkomer gives satisfactory results, especially in improving compression set.

Acceleration can be left unchanged or increased slightly. Santocure or Altax + DPG were used in the evaluation work and found to be quite satisfactory.

Loadings of the stock containing Falkomer may be maintained as in the basic stock. Occasionally when de-

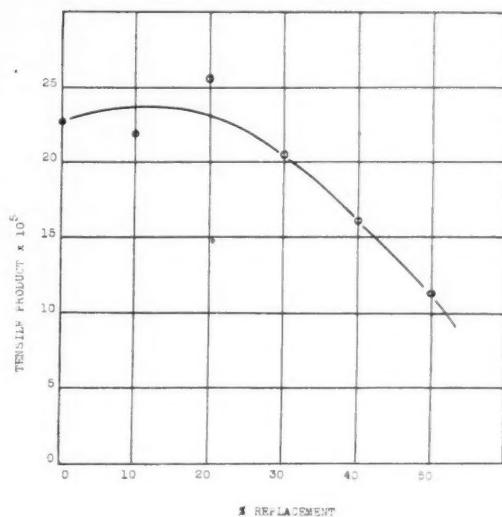


Fig. 1. Tensile Product vs. % Replacement in Hycar OR

siring to extend a stock highly loaded with soft or semi-reinforcing black it is advantageous to add to or replace about 10% of the soft black with channel black.

Softeners such as dibutyl phthalate and P-25 Cumar can be reduced in stocks containing Falkomer because of the softening action of the Falkomer itself. Reductions of 40% of the softener appeared practical in the test stocks, when 25 parts Falkomer were added to 100 parts Buna N.

Effect on Physical Properties of Cured Stocks

Tensile, hardness, elongation, and curing rate can be maintained in the same range by proper adjustment of sulphur, acceleration, and softeners at 25 parts Falkomer per 100 parts of Buna N type of synthetic.

Swell and extraction in solvents are increased somewhat by adding Falkomer, but no difficulty in meeting specifications has been experienced.

Aging characteristics of stocks containing Falkomer appear to be favorable, when compared with controls.

Freeze resistance is comparable to that obtained with coal-tar-type softeners. Falkomer stocks are inferior in freeze resistance to ester-type softener stocks. However certain combinations of Falkomer and ester-type softeners appear to give freeze resistance little, if any, inferior to the ester type.

The softening properties of the Falkomers in the uncured stock are comparable to those of the common types of softeners used in the synthetics. But the plasticizing effect in the cured stock is much less pronounced, and best results are apparently obtained by using the combination of Falkomer and ester type mentioned above. Compression set is increased by the addition of Falkomer, but stocks containing 25 parts Falkomer per 100 parts Buna N have been compounded to meet certain government specifications containing compression set tests.

¹ Thiokol Corp., Trenton, N. J.

Data on Falkomer-Synthetic Rubber Compounds

The test recipes given are not recommended compounds for any particular application, but merely illustrate what properties may be expected in Falkomer-synthetic rubber compounds.

Table 1 is a basic study of the effect of increasing percentages of Falkomer 108 in a Hycar OR stock without plasticizer. Examination of Figure 1, in which tensile product of optimum cure is plotted against per cent. replacement of Hycar OR, shows a maintenance of stress-strain properties up to 20-25% replacement.

TABLE 1. BASIC STUDY—REPLACEMENT HYCAR OR WITH FALKOMER 108									
	1	2	4	6	8	10			
Hycar OR	100	90	80	70	60	50			
Falkomer 108		10	20	30	40	50			
Zinc Oxide	5	5	5	5	5	5			
Altax	1.5	1.5	1.5	1.5	1.5	1.5			
Sulphur	1.5	1.5	1.5	1.5	1.5	1.5			
Neozone D	1	1.0	1.0	1.0	1.0	1.0			
Spheron +9	50	50	50	50	50	50			
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5			

Tensile, Stress, Elongation, Shore Hardness, and Tensile Product—Press cures at 310° F.									
	1	2	4	6	8	10			
45 Min. Cure	1	2	4	6	8	10			
Tensile, lbs. in. ²	4190	3490	3610	2750	2150	1550			
Stress at 300%	2480	1920	1400	1320	1080	900			
Elongation—%	440	510	570	600	610	590			
Shore Hardness	72	78	80	81	79	80			
Tensile Product	18.4 × 10 ⁶	17.8 × 10 ⁶	20.6 × 10 ⁶	16.5 × 10 ⁶	13.3 × 10 ⁶	9.2 × 10 ⁶			
60 Min. Cure									
Tensile, lbs. in. ²	4380	3460	3310	2750	2280	1650			
Stress at 300%	2700	2200	1680	1480	1240	1060			
Elongation—%	420	470	540	540	570	520			
Shore Hardness	73	79	81	82	80	81			
Tensile Product	18.2 × 10 ⁶	16.2 × 10 ⁶	17.9 × 10 ⁶	14.8 × 10 ⁶	13.3 × 10 ⁶	8.6 × 10 ⁶			
75 Min. Cure									
Tensile, lbs. in. ²	4040	3440	3380	2660	2160	1630			
Stress at 300%	2800	2340	1880	1620	1340	1120			
Elongation—%	380	430	490	500	500	480			
Shore Hardness	74	80	82	83	81	82			
Tensile Product	15.3 × 10 ⁶	14.8 × 10 ⁶	16.6 × 10 ⁶	13.3 × 10 ⁶	10.8 × 10 ⁶	7.8 × 10 ⁶			
% Swell 85/15 Kerosene-Benzol—48 Hrs. at Room Temperature									
60 Min. Cure	2.8	2.8	3.9	5.2	7.0	8.0			

Durometer hardness is increased, though not in proportion to the amount of Falkomer added.

Data on the per cent. swell were calculated as volume from measurements of linear swelling. Proportionate increase is noted with increasing Falkomer content.

Table 2 shows tensile deterioration and extraction of these stocks. Up to 20-25% replacement there is slight sacrifice of solvent resisting properties.

TABLE 2. TENSILE DETERIORATION 48 HRS. 85/15 KEROSENE-BENZOL AT 135° F. (See Table 1)

	Tensile before Test	Tensile after Test	% Change in Tensile
Cpd. 101 S-1	4330	2940-330	-32.2
Cpd. 2	3460	2500-370	-27.8
Cpd. 4	3310	2410-440	-27.2
Cpd. 6	2750	1900-450	-30.9
Cpd. 8	2280	1370-430	-40.0
Cpd. 10	1650	910-370	-45.0

EXTRACTION IN 100 OCTANE GAS 48 HRS.—NAVY SPEC. 33 H2C

	% Extracted
Cpd. 101 S-1	0.26
Cpd. 2	0.13
Cpd. 4	0.63
Cpd. 6	1.07
Cpd. 8	1.86
Cpd. 10	2.64

Table 3 is shown to compare the effect of Falkomer and dibutyl phthalate and to show the properties of combinations of Falkomer and other plasticizers.

Both Falkomer 108 and 106 give stocks with better stress-strain properties, but considerably harder than dibutyl phthalate. Falkomer 106 shows greater softening of cured stock than 108 though not in the range of dibutyl phthalate.

Examining compounds 4-9 in Table 3 will show that 25 parts Falkomer plus 15 parts other plasticizers can give comparable properties to a 25 parts dibutyl phthalate stock. Suitable compounding adjustments could be made

in several cases to duplicate the properties of the control stock, with a net saving or extending of synthetic rubber.

TABLE 3. FALKOMERS IN COMBINATION WITH OTHER PLASTICIZERS

	1	2	3	4	5	6	7	8	9
Hycar OR	100	100	100	100	100	100	100	100	100
Falkomer 108		25		25		25		25	
Falkomer 106			25						
Sulphur	1.5	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Zinc Oxide	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Spheron +9	50	50	50	50	50	50	50	50	50
Santocure	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dibutyl Phthalate	25			15	15				
Baker P-1 Oil									

TENSILE, STRESS, ELONGATION, AND HARDNESS—PRESS CURES AT 310° F.

	Tensile, lbs. in. ²	12990	2830	3070	2170	2360	2340	2440	1955	1905
10 Min. Cure	810	1000	735	425	535	405	325	295		
Elongation—%	710	750	770	880	900	920	930	970		
Shore Hardness	55	66	64	56	51	61	51	54	50	
20 Min. Cure	1115	1595	1420	880	705	1015	790	660	540	
Elongation—%	610	600	590	720	680	710	760	770		
Shore Hardness	58	68	66	55	64	59	57	52		
30 Min. Cure	1355	2195	1980	1295	1040	1525	1125	1020	785	
Elongation—%	550	460	450	590	600	570	590	640	670	
Shore Hardness	60	70	68	62	59	67	61	59	54	

Data to date, as shown in Table 4, has indicated that the Falkomers do not confer so good low-temperature flexibility as do the ester-type softeners, though 106 is better than 108. It appears, however, that in combination with the ester-type softeners fairly good freeze resistance can be obtained.

TABLE 4. FREEZE RESISTANCE* AT -10° F.—PRESS CURES 20 MIN. AT 310° F.

Hours	1½	2	3	4	5	6
1.5	S	B	S	S	S	B
5	VS	B	VS	VS	B	VS—Very Stiff B—Broke

*Flexibility of 4-inch × 1½-inch × 1½-inch strips tacked to 1-inch × 1-inch stick in loop. Strips pinched to test.

†First six stocks of Table 3.

Tables 5 and 6 compare the Falkomers with two standard extenders recommended for synthetic rubber. The Falkomers compare very favorably in most properties with the other extenders.

TABLE 5. COMPARISON OF THE FALKOMERS WITH OTHER EXTENDERS

	118S2	118S3	118S6	118S4	112S3	112S4
Hycar OR	75	75	75	75	75	75
Falkomer 108	25		25	25		
Falkomer 106						
Extender A						
Extender B						
Sulphur	2.0	2	3	4	2	2
Stearic Acid	0.5	0.5	0.5	0.5	0.5	0.5
Zinc Oxide	5.0	5.0	5.0	5.0	5.0	5.0
Spheron +9	50.0	50.0	50.0	50.0	50.0	50.0
Dibutyl Phthalate	25.0	25	25	25	25	25
Santocure	1.0	1.0	1.0	1.0	1.0	1.0

TENSILE, STRESS, ELONGATION, AND HARDNESS—PRESS CURES AT 310° F.

	Tensile, lbs. in. ²	1265	1595	1770	2140	1740
10 Min. Cure	460	350	430	620	410	625
Elongation—%	890	820	750	700	820	630
Shore Hardness	58	50	48	54	53	56
20 Min. Cure	1730	1940	2080	2430		
Elongation—%	630	660	550	500		
Shore Hardness	60	53	55	57		
30 Min. Cure	1940	2030	2110	2500	2060	1880
Elongation—%	750	720	1190	1720	735	1375
Shore Hardness	62	55	58	60	57	61

TABLE 6. SWELLING AND EXTRACTION TESTS

	24 Hrs. 813 Fuel	48 Hrs. in 100 Octane Gas
Extraction	21.5	4.06
	27.0	4.0
	...	4.4
	26.0	5.4
	6.2	
	29	

Conclusions

It is believed that the Falkomers should have some usefulness in the field of synthetic rubber compounding. In practice they appear to best advantage when used not in excess of 20-25% on the synthetic and in combination with other plasticizers.

No examples of practical stocks have been given, but it is hoped that the rubber compounder can be guided by the indications of properties described in order to evaluate the material in the best manner.

German Patents Relating to Vinyl Polymers—XIII

M. Hoseh

NEWW substances that can be spun into thread and made into films, coatings, and putties result from polymerizing water-insoluble acrylates, or their homologs, together with other organic, polymerizable compounds containing an olefinic double bond (150). As water-insoluble acrylates should be considered: acrylonitrile diethylacryloamide, acryloanilide, acrylic esters of aliphatic and aromatic, mono- and poly-hydric alcohols and their substitution products such as glycalmonomethyl ether, ethylenechlorhydrine, etc.; also derivatives of α -alkylacrylic acid, e.g., methacrylic acid. As the other component, vinyl acetate, vinylchloride, and styrol may be used. Plasticizers, e.g., H_3PO_4 esters, and fillers, e.g., chalk, $BaSO_4$ etc., as well as pigments may be added if needed. In a way this process is an extension of (35).¹

As described in (151), dyes of the Congo red group (*Azo-dyes*) have the unique property of changing the mechanical, thermal, colloidal, and chemical properties of polyvinyl alcohols, and especially their higher polymers. This striking effect influences similarly esters, acetals, and ethers of the above-mentioned compounds that are soluble in water or which swell in water. Under the influence of Congo red dyes the viscosity, elasticity, toughness, tensile strength, bending strength, resistance to compression, temperature resistance, resistance to boiling, impermeability to gases, vapors, and liquids, and the resistance to water and organic solvents are enhanced. The Congo red dyes can be added at any stage of the processing. They can be added to a suspension, paste, or solution of the polyvinyl alcohol or its derivatives; they can be added before molding or thermo-pressing, and with equally good results the formed products (films, thread, tubes, etc.) can be treated with it. The use of Congo red compounds does not interfere with the addition of fillers, plasticizers, pigments, etc.

In (152) are described a method and a procedure for making polishing disks and molded articles from polymers. More details are lacking as this patent has not been received in the United States Patent Office.

Unstable solutions of polyisobutylene are stabilized effectively by small additions of antioxidants (153). The original German patent has not been received.

In (154) is described a method of improving the technique of shaping polymers or mixed polymers of the vinyl series when hot water is used as a means of softening these polymers. The addition of inorganic salts capable of absorbing water to the hot water of the shaping bath prevents water absorption by the polymers when they are immersed into the hot water to make them pliable for the shaping operations. If this is not done, the value of the molded products is greatly impaired. The effectiveness of the use of these salts depends on the nature of the salt and its concentration in the water. It was found very effective to use the following concentrations of the respec-

tive salts: 33% of $CaCl_2$, 35% of K_2CO_3 , 40% of $Na_2S_2O_3$, 33% of $MgCl_2$, or 35% of $CuSO_4$. The use of any of these solutions for the shaping bath leaves the polymers completely clear and free of absorbed water which previously gave them a "milky" appearance.

The "milkeness" due to water absorption occurring in polymers of the vinyl series when they are soaked in hot water (see 154) can also be avoided by using hot dihydric or trihydric alcohols, e.g., glycol or glycerol (155). The monohydric alcohols, methyl, ethyl, or butyl alcohol, and their higher homologs do not have this property. Foils soaked in them become "milky".

According to (156), the polymeric acetals can be produced from polyvinyl esters and aldehydes as well as by means of the older reaction of polyvinyl alcohol and an aldehyde. Essentially the new procedure is carried out in the same manner as the old one. The polyvinyl ester is dissolved in an appropriate solvent and caused to react with an aldehyde in the presence of slight amounts of acid. The reaction is conducted in the presence of substances promoting saponification so that the ester groups are completely saponified. The new method obviates the necessity of preparation and isolation of the polyvinyl alcohol. The conditions of the reaction may vary within rather wide limits. As esters of polyvinyl alcohol may be used acetate, propionate, or benzoate. As aldehyde may be used formaldehyde, glyoxal, acetaldehyde, benzaldehyde, etc. The condensation products obtained by this method are valuable for the lacquer industry and for electric insulators.

The products obtained by the processes outlined in (2)² (3)² and (11)² are soluble neither in water nor in any other solvent; they do not melt, and for all practical purposes cannot be molded, but this situation can be remedied if the mixed polymers in question are mixed with appropriate plasticizers. (157). As such are used heavy, non-volatile, water soluble, or at least water absorbing polyhydric alcohols: glycols, especially glycerol, also sorbitol, pentaerythritol, polyglycols, and such hydroxycarboxylic acids as glycolic, lactic, saccharic, etc. The polymer is mixed with the plasticizer and a little water. The resulting plastic mass is readily pressed into rods, sheets, bands, tubes, or into any desired mold. The products obtained are highly elastic and mechanically resistant, besides being resistant to solvents.

Water insoluble foils prepared from polyvinylacetals discolor upon storing, and under the influence of heat, but this condition can be prevented by an addition of antioxidants to the polyvinyl acetals. (158). As such are used phenolic substances, particularly polyhydric phenols such as hydroquinone, pyrogallol, and hydroxyphenylated indans. Usually 1% of the antioxidant suffices to achieve the desired results. These antioxidants also affect favorably other properties; in particular, they prevent the foils from becoming brittle when heated.

In (159) is described a method for embedding colored layers into objects molded from polymers, i.e., those of methacrylates, acrylates, styrol, vinyl acetate, generally those conforming to the type $CH_2:C<$. The coloring matter is thoroughly mixed with a binder, which should be of such nature as not to dissolve in the polymerizable substance. Suitable binders are: proteins as casein and al-

¹ INDIA RUBBER WORLD, Nov. 1, 1941, p. 158.

² Ibid., Mar. 1, 1942, p. 571.

bumin; high molecular natural substances soluble in water or alcohol, as gum arabic and mastic; synthetic products, as water soluble cellulose ether, polyvinyl alcohol, derivatives of carboxylic acid polymers; mixed polymers, as the alkali salts of polyacrylic and polymethacrylic acid; fats and waxes. The mixture of the coloring matter and the binder is applied onto the inside wall of the mold; then the polymerizable substance is added, and polymerization conducted as usual. The coloring layer may be of one color or of several colors; it may have a simple or complicated design; it may contain pictures, signs, writing, etc. Any suitable dye or pigment may be used. The coloring layers produced by this method are embedded just beneath the surface; they are much superior to the usual lacquering or pressed-on foils. When this method is used it is advantageous to prepolymerize the polymerizable compounds, and in the final stages of molding to proceed as above.

A novel method for polymerizing acrylates, their homologs, and derivatives, usually polymerized in a state of fine subdivision, e.g., in aqueous emulsions, is described in (160). The catalyst is usually dissolved either in the monomer or in the dispersing medium. In this new method the polymerization catalyst is dissolved in the acrylate, and the latter plus the catalyst is prepolymerized to a barely fluid state. The prepolymerized substance is then sprayed into hot gases so that final polymerization sets in within a few seconds. If necessary, the solidified polymers are subsequently heat-treated. Suitable gases are air, nitrogen, or other inert gases. The hot gases may flow direct or counter current to the flow of the sprayed polymer. Depending on the spraying apparatus, the product will be a fine thread or a powder.

According to (161), good yields are obtained when the alkali or ammonium acrylates are polymerized in a weakly acid aqueous solution. It is well known that monomeric alkali acrylates can also be polymerized in organic solvents. However, this process is of little practical use since the polyacrylates are mostly used in aqueous solutions, and in the subsequent recovery of the organic solvents are great difficulties encountered. In the polymerization of alkali acrylates in aqueous solutions as usually carried out, the yield of the polymer is small, since part of the alkali acrylates is transformed into hydroacrylates which do not polymerize. In this new method the polymerization is conducted in the presence of 5-15% of a weak, preferably organic, acid adjusting the pH of the medium to 4.5-5.5. The salt concentration is maintained at 20-40%, preferably 30%. At a lower concentration low polymers will form; whereas higher concentrations are accompanied by an evolution of too much heat. The polymerization of salts is preferable to the polymerization of the free acid for the reaction proceeds quietly and also because metallic reaction vessels can be used, such as those lined with chromium-nickel steel. The neutralization of the acid and the adjusting of the desired concentration of the resulting salt can be safely undertaken in such vessels. Also the use of salts eliminates the possibility of distillation of the acid by the heat evolved in the reaction and thereby prevents losses of acrylic acid and the hazard of acid vapors.

In (162) is described the polymerization of vinyl pyridine. Thus α-, β-, and γ-vinyl pyridine, by themselves or mixed with other polymerizable substances, are polymerized by heat or in emulsions in the presence of polymerization promoters. The polyvinyl pyridines are acid soluble and are used for molding objects or as a textile aid. The

solubility of the polymer in acid can be regulated by incorporating other substances into the polymer. Thus, pure polyvinyl pyridine is soluble in dilute acetic acid; whereas a mixed polymer of 80 parts of styrol and 20 parts of vinyl pyridine require glacial acetic acid. Mixed polymerization of vinyl pyridine and a conjugated diene, e.g., butadiene or isoprene, produces a rubber-like substance. Also polymers of more than two components, e.g., vinyl pyridine, styrol, and butadiene, can be produced.

New high molecular resins are obtained by mixed polymerization of styrol with aromatic hydroxy compounds, e.g., phenols or naphthols (163). The polymerization is catalyzed by acid reacting substances capable of polymerizing styrol, e.g., SnCl_4 or HBF_4 . Depending on the working conditions, the products range from thick oils to solids. The new products are soluble in the usual lacquer solvents, drying and non-drying oils. Increasing the phenol content lowers the softening point. The polymerization can be conducted at low or high temperatures; in the latter case the heat of reaction is utilized, after an initial slight pre-heating of the reactants. To regulate better the course of the reaction, it is preferable to conduct the polymerization in an inert solvent as benzine, benzene, or CCl_4 . After the reaction is completed, the catalyst is removed by treating the reaction mixture with burned lime, BaO , or similar substances. It is also advisable at this stage to add to the reaction mixture a bleaching clay to increase the clearness of the product. These products are very valuable in the lacquering and varnish industry. The viscous polymers which retain some of their phenolic character are used advantageously as plasticizers.

The use of high polymers of isobutylene as adhesives is described in (164). Depending on the degree of their polymerization, the products have a molecular weight of 2,000-70,000 and over. The adhesives are resistant to acids, alkalies, oxygen, and light. They are chemically inert and have no corrosive action on wood, metals, and textiles. The adhesives can withstand temperatures of 250-300°C. without decomposing. They are colorless and can be prepared clear. Although mostly they are soluble in benzene, benzine, mineral oils, esters, and ethers, their solubility in these solvents decreases as the molecular weight increases. These polymerization products can be used as putties, tree wax, anti-skid on tires, transmission belts, etc. See also (26)³ and (623,924) for other uses of similar polymers.

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Some Physical Properties of Butadiene and Styrene¹

Lawrence A. Wood
and Catherine F. Higgins

WITH the expansion of the production of synthetic rubber in the United States the National Bureau of Standards has received a number of requests for data concerning the physical properties of the raw materials used for making synthetic rubber. The variety

SOME PHYSICAL PROPERTIES OF 1,3-BUTADIENE
Alternative Names: Biethylene, Bivinyl, Divinyl, Erythrene, Pyrolylene, and Vinylethylene

Property	Value	Source
Molecular weight of C_4H_6	54.088	-
Normal boiling point	-44.6° C.	1
Freezing point	-108.9° C.	1
Density of vapor at 0° C. and 760 mm. of mercury	0.90248 g·ml ⁻¹	4
Density of liquid in g·ml ⁻¹	Value 0.6690 .6455 .6210 .6146 .5958 .5682	3
Thermal expansion (liquid) from -20° to +60° C., t in ° C., $V = V_0 (1 + 1.8528 \times 10^{-3} t + 5.148 \times 10^{-6} t^2 + 29.2 \times 10^{-9} t^3)$	973.6	3, (2)
Vapor pressure from -80° to +40° C., $\log_{10} p = 6.96128 - \frac{t + 24.3}{973.6}$	1	
t in ° C., p in mm. of mercury	-78.51° -4.6° 0° 25° 40° C.	11.2 760 908 2144 3338
Rate of change of boiling point with pressure at the normal boiling point	0.0334 (° C.) × (mm. of mercury) ⁻¹	1
Heat of vaporization at normal boiling point	99.80 cal·g ⁻¹	1
Heat of fusion	35.28 cal·g ⁻¹	1
Heat of formation of vapor at 25° C.	1908 cal·mole ⁻¹	5
Heat of combustion of vapor at 25° C. at constant pressure (1 atmosphere)	26.865 cal·mole ⁻¹	5
Specific heat of liquid at 25° C.	11.055 cal·g ⁻¹	5, (2)
Refractive index for D-line at 25° C.	1.4293	6
Unit cell of crystalline material	$a = b = 13.20$ Angstrom units $c = 8.46$ Angstrom units	7
Limits of flame propagation in mixtures with air	2 to 11.5% (by volume) of butadiene	8

(British Engineering Units)

Property	Value	
Normal boiling point	23.7° F.	
Freezing point	-164.0° F.	
Apparent density in air in lb·gal ⁻¹ (U. S.)	Value 5.550 5.445 5.333 5.221 5.101 4.988 4.862 4.733	
Specific gravity with reference to water at 60° F. (vacuum)	Value 0.6668 .6542 .6408 .6277 .6131 .5994 .5843 .5688	
Vapor pressure p in lb in ² abs.	Temp. -109.32° 23.7° 32° 70° 105° F.	
Rate of change of boiling point with pressure at the normal boiling point	Value 0.217 14.7 17.6 36.6 65.6	
Heat of vaporization at the normal boiling point	1.528 (° F.) × (in. of mercury) ⁻¹	
	179.6 Btu·lb ⁻¹	

¹ Letter Circular LC-710, United States Department of Commerce, National Bureau of Standards, Washington, D. C., Dec. 9, 1942.

SOME PHYSICAL PROPERTIES OF STYRENE
Alternative Names: Cinnamene, Phenylethylene, Styrol, and Vinylbenzene
(Metric System Units)

Property	Value	Source
Molecular weight of C_8H_8	104.144	-
Normal boiling point	145.2° C.	9
Freezing point	-30.60° C.	1
Density in g·ml ⁻¹	Temp. 0° 20° 25° 40° 60° 80° 100° 120° 145° C. Value 0.9240 .9056 .9010 .8873 .8689 .8506 .8322 .8138 .7909	10
Rate of change of density with temperature between 0° and 145° C.	-918×10^{-6} gm·l ⁻¹ ·°C. ⁻¹	10
Vapor pressure between -8° and +145° C.	$\log_{10} p = 7.2788 - \frac{1649.6}{T + 230}$	10
t in ° C., p in mm. of mercury	0° 25° 100° 145.2° C. 1.28 6.45 166.0 762.4	
Rate of change of boiling point with pressure at the normal boiling point	0.0487 (° C.) × (mm. of mercury) ⁻¹	10
Heat of vaporization at normal boiling point	86.9 cal·g ⁻¹ 9040 cal·mole ⁻¹ 25.3 cal·g ⁻¹ 2645 cal·mole ⁻¹	2
Heat of fusion	0.415 cal·g ⁻¹ (° C.) ⁻¹ 43.0 cal·mole ⁻¹ (° C.) ⁻¹	11
Specific heat at 25° C.	1.5443	10
Refractive index for D-line at 25° C.	-560 × 10 ⁻⁶ (° C.) ⁻¹	10
Rate of change of refractive index with temperature between 17° and 26° C.	32.14 dynes·cm ⁻¹	12
Surface tension at 19° C.	1.1 to 6.1% (by volume) of styrene	13
Limits of flame propagation in mixtures with air	(British Engineering Units)	
Property	Value	
Normal boiling point	293.4° F.	
Freezing point	-23.08° F.	
Apparent density in air in lb·gal ⁻¹ (U. S.)	Temp. 32° 60° 70° 105° 130° 293.4° F. Value 7.702 7.582 7.540 7.392 7.285 6.590	
Specific gravity with reference to water at 60° F. (vacuum)	Temp. 32° 60° 70° 105° 130° 293.4° F. Value 0.9249 .9105 .9055 .8877 .8749 .7915	
Vapor pressure p in lb in ² abs.	Temp. 32° 60° 70° 105° 130° 293.4° F. Value 0.0237 .0704 .0787 .294 .585 .14.74	
Rate of change of boiling point with pressure at the normal boiling point	2.22 (° F.) × (in. of mercury) ⁻¹	
Heat of vaporization at the normal boiling point	116 Btu·lb ⁻¹	

to be produced in largest amounts is Buna S, and consequently data are very often required for butadiene and styrene, the materials which are copolymerized to make Buna S.

A search of the literature has been made, and certain properties have been measured at this Bureau in the course of investigations, the results of which in many cases have not yet been published. The values which are regarded as the most reliable at the present time (December, 1942) have been collected and put into tabular form. They are presented at this time in order to meet an immediate demand for such data. It should be recognized that in most cases they have not been checked by independent observations. Revisions will be made as further information becomes available.

Especial thanks are due to the Phillips Petroleum Co. for making available its unpublished measurements of the density of liquid butadiene at different temperatures.

For the convenience of engineers accustomed to using

the British engineering system, certain values are also given in the units of this system. They were obtained by conversion from the metric values given in the first part of each table.

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KemPol Chemurgic Rubber

COMMERCIAL production of chemurgic rubber, based on domestic drying oils ordinarily not considered suitable for edible purposes, has been under way at the Chicago plant of The Sherwin-Williams Co. for several months, according to N. E. Van Stone, vice president in charge of operations. Called KemPol, the new material is an original development of the Sherwin-Williams research laboratory's basic research work with oils. Results of early experiments had indicated the possibility of synthesizing a vulcanizable polymer from domestic oils, and these furnished the basis for the final commercial development completed recently.

KemPol requires neither critical equipment nor critical materials for its manufacture—a fact which enables a tremendous volume of production from existing equipment limited only by the amount of oil available for the purpose.

Tensile strength, elongation, and abrasion resistance of KemPol are not equal to those of natural rubber although in many other properties it compares so favorably with rubber as to enable its use in many products. Molded and extruded products such as treads, mats, pads, erasers, jar rings, food and other closures (KemPol contains no toxic raw materials, it is stated), gaskets, braided hose, and many other similar products may be made from KemPol.

This chemurgic rubber lends itself readily to emulsification, and with certain limitations, to solutions, so that a number of successful commercial applications in the fields of fabric coating, tapes, adhesives, sealing compounds, etc.

pH, Surface, and Structure

(Continued from page 468)

P-33 carbon, on the other hand, gives anomalously low values in bound rubber. Shore hardness, modulus, and rubber absorption, ascribed to total absence of carbon-carbon bonds. This inertness of surface might be expected to result in easy and discrete dispersion of such carbons, a result recently confirmed by an electron microscope study of P-33 rubber cement.⁸ Associated with this lack of carbon-carbon bonding is a deficiency of carbon-rubber bonding, confirmed by the low reinforcement properties of these carbons.

These various relations, involving the role of surface and of structure, in the behavior of colloidal carbons are brought together in the table which is printed on page 468.

The part played by these fundamental carbon properties, of pH, surface area, and structure in the reinforcement of synthetic rubber, on the basis of recent studies in the Columbian Carbon Laboratories, will be the subject of a brochure to be released in the near future.

Correction

In the article, "A Broad Nomenclature for Carbon Blacks", which appeared on page 378 of our January, 1943, issue, in the table and in the paragraph immediately preceding it in the second column, the expression "pounds per acre" should read "acres per pound" throughout.

have resulted. KemPol sponges readily, offering many possibilities in that field.

KemPol also shows considerable promise as an extender for natural, reclaimed, and the buna and Butyl rubbers, with all of which it is readily compatible.

The tacky nature of the polymer in most applications requires slightly different compounding procedure. Incorporation of appropriate amounts of pigments and accelerators in a heavy-duty mixer, followed by a "bake-cut" or "pre-cure", results in a compound sufficiently dry for milling, final compounding, and vulcanization. Standard rubber making equipment, as found in the average rubber plant, is entirely adequate for the purpose. The customary fillers, extenders, accelerators, etc., have been found to work well with KemPol although occasionally variations from normal proportions may be found advisable.

KemPol stocks, properly compounded, have shown: tensile strength, 300-500 pounds per square inch; elongation, 100-150%, and short hardness, 40-70 without too great changes in these properties on aging.

Chemical and solvent resistance are, in general, similar to rubber, specifically: water has no effect; alcohol, no swelling, but impaired flexibility; aliphatic hydrocarbons, 50% swelling, tender; aromatic hydrocarbons, 200% swelling, very tender; dilute mineral acids, very slight swelling; concentrated mineral acids, poor resistance, especially with oxidizing acids; and with dilute and concentrated alkalis, very poor resistance.

Pigmented with black, dielectric strengths of about 185 volts per mil have been obtained. Ozone resistance is excellent, greatly superior to black rubber.

Advances in Rubber During 1942¹

J. H. Dillon²

PEARL HARBOR and subsequent events in the Far East have made 1942 a year of amazing and far-reaching changes in the field of resilient materials. With the United Nations suddenly cut off from more than 90% of their crude rubber sources, it became necessary to develop immediately and produce adequate quantities of rubber substitutes. In general the principal emphasis in the field of synthetic rubber prior to the war emergency had been to develop "specialty rubbers", designed to give better performance in certain particular types of service where resistance to oil, solvents, ozone, etc. was essential. Substantial progress in the development of general-purpose substitute rubbers had been made, but large-scale experience in their production and application was lacking as 1942 began. Fortunately a moderate supply of crude rubber existed in the United States, and this, combined with a large production of reclaimed rubber, has served to meet essential military requirements as the great new Buna S³ plants come into production, and experience is gained with Buna S products of all types. Meanwhile the limited productions of neoprene, "Thiokol", Butyl, and the several varieties of acrylonitrile-butadiene rubbers are being used to capacity in specialized military applications.

It is clear, then, that the mechanical engineer no longer has at his disposal unlimited quantities of resilient materials of time-tested quality. His first responsibility in 1942 was to reduce or, if possible, eliminate rubber or synthetic rubber in existing machines and other products and employ it as little as possible in new designs. He must be thoroughly conversant with the availability and properties of the various types of rubbers, natural and synthetic, so that he may be able to select the type best suited to a given application without unnecessary depletion of the limited supply of the higher-quality rubbers.

Supply Position on Natural and Synthetic Rubbers

An excellent summary on the present supply and projected production of natural and synthetic rubbers is given in the complete Baruch Report (1).⁴ An accurate description of progress in synthetic rubber is given by H. I. Cramer (2). Necessary wartime secrecy has severely limited publication of detailed data on military products employing rubber and synthetics. Nevertheless, because of the magnitude of the development program, a considerable literature accumulated in 1942. Reclaimed rubber (3, 4) found increasing use in combination with both natural rubber and Buna S. Passenger-tire recaps made entirely with reclaim have given reasonably good tire mileages. An improved type of reclaim was announced by Boston Woven Hose & Rubber Co., but details as to its manufacture and properties have not been publicly announced (5). While small, but important shipments of *Hevea* rubber should continue to arrive from Africa and from South and Central America in increasing amounts,

¹Presented in part before the Rubber & Plastics Group of the American Society of Mechanical Engineers, Hotel Astor, New York, N. Y., Dec. 3, 1942. "Advances in Plastics during 1942" by G. M. Kline, the other half of the annual report on rubber and plastics, will appear in a forthcoming issue.

²Physical research division head, Firestone Tire & Rubber Co., Akron, O. Note that the Buna S made in the United States is similar, but not identical, to the German Buna S.

Bibliography references are listed at end of article.

Rubber Reserve Co. Circular No. 13, Jan. 8, 1943, designates Buna S made under government program as GR-S (See p. 498 this issue). EDITOR.

Rubber Reserve Circular No. 13 designates neoprene made under government program as GR-M. EDITOR.

intensive efforts have been made to develop other natural rubber yielding plants which can be grown in North America. Of these, the guayule shrub is the most promising, and, as projected plantings give greater and greater yields, guayule rubber in its deresinated form will be of great value as a partial replacement for *Hevea* rubber. Passenger-car tires and tubes made exclusively of underesinated guayule were reported to give mileages of 8,500 to 10,500 as early as 1934 (6). More recent data on the properties of guayule have appeared (7, 8). Other types of rubber yielding plants being studied include *Cryptostegia Grandiflora*, *Fostcronia Floribunda*, *Asclepias Sublata* (milkweed), and golden rod. X-ray diffraction diagrams showing the similarity of these rubbers to *Hevea* have been published (9).

Domestic Buna S—GR-S⁵

Buna S, a copolymer of butadiene and styrene, has been chosen as the principal mass-production synthetic rubber on the basis of its general characteristics and relative facility for economical production from domestic raw materials, petroleum, or alcohol and coal tar. Like all known synthetic rubbers, it has a rather high internal friction and hence generates more heat in dynamic applications than does natural rubber (10). It is weak and easily torn in a gum stock, but, when loaded with adequate concentrations of carbon black, shows good tensile and abrasive properties (11, 12, 13). It appears to resist decomposition at high temperatures better than does natural rubber (14). It resists oils, solvents, and ozone to about the same extent as natural rubber and is not outstanding in these respects. Although more difficult to process than natural rubber, with certain changes in techniques, it can be handled with regular rubber processing equipment (15). Difficulties are encountered in adhering it to itself because of its characteristic lack of tack in the unvulcanized state, but these are being overcome (16). Passenger tires constructed entirely with Buna-S (GR-S) compounds have proved fully equal to tires made with *Hevea* rubber. Truck-and bus-size tires have presented a greater problem, but rapid developments of the past few months indicate that this problem is being solved also. This same statement applies to nearly all mechanical goods applications. Unquestionably the development of processing methods and compounds of Buna-S (GR-S) in 1942 constituted the greatest progress in the rubber industry in many years. Much remains to be learned in the application of Buna-S (GR-S), and the mechanical engineer will play an important part in this program.

Neoprene Synthetic Rubber—GR-M⁶

Neoprene in its various forms can hardly be termed a development of 1942 for engineers had become familiar with its high resistance to oils and ozone (17) and had found many applications for it. Because of its oil and solvent resistance it has been employed in self-sealing fuel tanks and hose. Because of its low permeability to gases and high ozone resistance it has been used almost exclusively for coating the fabric of barrage balloons which now operate at altitudes of 10,000 to 15,000 feet. The low resistance of neoprene to cold, as compared to *Hevea* rubber

and Buna S, has become a serious difficulty in its application to high altitude airplane parts (18). However a new variety, Neoprene FR, has been brought out which has a much improved flexibility at low temperatures (19). Neoprene cements have been of great value for adhering not only neoprene, but natural rubber and other synthetics. Neoprene latex appears to show promise in many applications.

Buna N Synthetic Rubber

The acrylonitrile-butadiene copolymer type of synthetics (Perbunan, Hycar OR, Chemigum I, II, and III, Butaprene-N types, etc.) have not yet been manufactured in large volume because of the necessity of employing most of the available butadiene in Buna S, and the acute shortage of acrylonitrile. The limited amounts available, however, have been used very effectively in self-sealing fuel and oil tanks, bullet-proof hose, etc., where their exceptional resistance to ordinary gasoline and oil is of value (20, 21). They are not entirely proof against aromatic fuels and lose flexibility at low temperatures. Butaprene NF, a material of this type having improved resistance to cold, has been announced (22). Materials of this type are not comparable to neoprene and Butyl in resistance to ozone. Like Buna-S (GR-S), they require a rather high carbon black loading in order to develop good physical properties, have a higher internal friction, and are more difficult to process and adhere. In general a rather high percentage of a softener (10% or more) is employed to make processing possible. Such softeners thus act as extenders for the material and in some cases improve its low temperature flexibility.

Butyl Synthetic Rubber—GR-I⁷

Butyl rubber, reported to be a copolymer of isobutylene with butadiene or isoprene, has become available in small quantities for certain special military uses (23, 24). It possesses a very low chemical unsaturation and hence is very stable chemically. It has a very low permeability to gases and at the same time has a lower specific gravity than neoprene, 0.9175 as compared to 1.25 (25). Hence it has excellent possibilities as a proofing material for balloon fabrics. It has been tested in passenger-size tires and in recaps, but does not appear to have the abrasion resistance possessed by *Hevea* rubber. It has been stated that it is adaptable to fire hose, steam hose, molded goods, and conveyer belts. A more easily produced lower quality variety of Butyl called Flexon has also been tested as an emergency recap material for passenger tires with some success.

"Thiokol" Synthetic Rubber—GR-P⁸

The several varieties of "Thiokol," organic polysulphides, have been in use for a number of years in products where oil resistance, ozone resistance, or low gas permeability is essential (26). "Thiokol" has an extremely unpleasant odor and is thermoplastic. Hence it is very limited in application. However recent tests with "Thiokol" recaps have indicated it as a possible emergency material, provided its extremely poor cold resistance is corrected. A new odorless variety, "Thiokol" RD, has lately been announced which is reported not to be a polysulphide reaction product (27).

Other Substitutes for Natural Rubber

A group of materials which can be used to replace rubber in gaskets, hose, coatings, etc., but which are thermoplastic and not highly extensible, has become increasingly important (2). This group includes Koroseal, Vinylite, Resistoflex (28), Velon, Saran, Formivar, Butvar, Butacite,

Acryloid, plasticized ethyl cellulose, and plasticized cellulose acetate (29). Most of these materials are tough and flexible and have high resistance to oils and solvents. Some have been tested in tire recaps with small success to date. Incidentally, all materials of low extensibility, such as wood, vulcanized fiber, etc., have proved entirely unsuitable for automobile tires, in the opinion of competent engineers, although many optimistic statements have appeared in the public press.⁹ A new product called Norepol, produced from soybean oil, appears to approximate rubber to a higher degree (30, 31). It has shown promise as a tire recap material.

Product Developments in 1942

The greatest product development of 1942 is undoubtedly that of the synthetic-rubber heavy-duty tire. Details are completely lacking in the literature, and none can be revealed here. Some basic design data on tires have been given, however (32, 33). An interesting paper on rubber tracks for military vehicles and tractors has been published (34). Intensive work has been done on bullet-proof combat tires and tubes for various types of military vehicles. The replacement of rubber in tank track blocks by steel has eliminated a difficult problem for the rubber technologist and results in a large rubber saving. It is doubtful, however, if this step will make the perfection of the bogie roller less difficult. It certainly has not eliminated tank radio static. The introduction of electrically conducting rubber in the track block bushings should be effective in this respect. A paper which treats the problem of static electricity in pneumatic tires and its solution by means of electrically conducting treads and sidewalls has been published (35). Conducting rubber compounds were employed to an increasing extent in 1942 in airplane tires, industrial tires for munitions plants, flooring and caster wheels for hospital operating rooms, truck and bus tires, etc.

Very little detailed information has been given on the many new types of rubber parts for aircraft and military vehicles. Two very valuable papers on the vibrational properties of rubber have appeared (36, 37). Outstanding among aircraft developments are self-sealing fuel and oil tanks. Their use has already permitted the return of many a bullet-riddled bomber or fighter to its base and saved the lives of many pilots. In general these tanks have been of the internal type. The 1942 designs have been improved in sealing qualities against heavy caliber ammunition, effectiveness at low temperatures, and resistance to penetration of fuel through the inner liner. Weight and wall thicknesses have been reduced. The danger of extraction of soluble materials from the inner liner has been greatly decreased, and the problems introduced by the use of aromatic fuels are approaching solution. It now appears that fuel tanks must be made "crash proof" as well as self-sealing. Self-sealing hose for fuel and oil lines also was improved in 1942.

Intensive development work has resulted in a wide variety of inflatable products classed as flotation gear. This class includes life belts, life rafts, landing boats, and pontoons capable of supporting a bridge for 30-ton tanks. Several varieties of barrage balloons for both naval and land service have been engineered and put into large-scale production during the past year.

In the field of industrial products, conveyer and transmission belts reenforced with steel cable cords have been notable contributions to war production. A new develop-

⁷ Rubber Reserve Circular No. 13 designates Butyl made under government program as GR-I. EDITOR.

⁸ Rubber Reserve Circular No. 13 designates "Thiokol" made under government program as GR-P. EDITOR.

ment in airplane tire design is the "Channel Tread" which is reported to give improved traction, flotation, and load carrying capacity. It is particularly effective in tail wheel tires for catapult planes. An airplane tire with metal studs cured into the tread for use on ice-covered landing strips has been announced. Another type has a tread made of soft, rough crepe rubber. An extremely interesting item, from the standpoint of the future, is a soundproof room supported on rubber, developed at Northwestern University.

Technical Literature

Work on the ASTM hardness test project has been interrupted by the exigencies of the war effort. Tentative recommendations have been made however (38). A laudable beginning has been made by a joint A.S.T.M.-S.A.E. committee in the classification of rubber and synthetic rubber stocks according to their physical properties (39).

The technical literature includes many valuable papers on the properties and testing of natural and synthetic rubber stocks (40 to 47). An enormous amount of theoretical work on the structure of rubber-like materials has been reported in the literature of the past year (48 to 53). Only a few of these papers can be included in this bibliography, but it may be said that great progress has been made in this field which will eventually lead to results with practical engineering value. In general, progress in rubber technology and engineering in 1942 has been of the highest order. When the necessity of war-time secrecy finally disappears, 1942 may prove to have been the outstanding year in the history of rubber progress.

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Carbon Black in Treads

(Continued from page 470)

bon black probably of the standard or harsh type. Since the different blacks added represent less than 50% of the total black content, it might be expected that differences due to the added black would be considerably less than in the case of an all-rubber stock. In most cases where trends are detectable, they are in the direction to be expected from our experience with rubber.

Estimates based on the amount of synthetic rubber recommended by the Baruch Committee indicate that the maximum amount of carbon black which the industry is capable of producing will be insufficient for reinforcing all of this synthetic rubber. Standard channel blacks can be obtained in considerably higher yield than soft channel blacks; so the use of standard channel blacks would enable carbon black manufacturers to increase their total production. Since the behavior of soft and standard channel blacks appears to be similar in reclaim tire treads, the use of the standard black may be indicated even at some sacrifice of processing convenience in order to conserve channel black and insure an adequate supply when the synthetic rubber program is fulfilled.

The authors would like to acknowledge here the assistance rendered by J. M. Ruffner and other members of Continental Carbon Co.'s laboratory staff and also by A. W. Oakleaf, of Continental Carbon Co., who suggested this study.

EDITORIALS

Synthetic Rubber Plant Construction Must Not Be Further Delayed

ANNOUNCEMENT of the recent conference of President Roosevelt and Prime Minister Churchill, which has resulted in plans for stepping up our offensive action against the Axis, may be used to explain some of the reasons for the new difficulties that have been confronting Rubber Director Jeffers in his efforts to administer the rubber program. At the same time now that it is known in a general way, at least, that the demands on our industrial production by the armed services will be increasingly greater in 1943, it should be easier for the Rubber Director with the help of the rubber industry to fight against further delay in the synthetic rubber plant construction program.

The Army and Navy, by virtue of their prior knowledge of possible new developments on the war fronts, have apparently been able to bring increased pressure on WPB Chairman Donald Nelson in their demands for equipment for their programs, even though the type of equipment in greatest demand, such as valves, heat exchangers, and control instruments, is equally essential for the completion of the synthetic rubber plants. In addition, it has been stated, that one of the problems of the WPB in this connection has been that the Baruch Report in discussing the rubber requirements of the armed services stated that: "The military men must decide what things come first in war production—", and this statement has been used effectively by the military in their demands for equipment priorities. The difficulty here is that the remainder of this statement, which is of equal or even greater importance, has been underemphasized. The statement goes on to say that: "—but it is the duty of the Committee to point out that unless the flow of materials for the construction of these synthetic rubber plants is insured, there will be no rubber in the fourth quarter of 1943 with which to equip a modern mechanized army."

Chairman Donald Nelson in his appearance before the Gillette agricultural sub-committee on January 26 stated that 55% of the synthetic rubber program "will be carried through as rapidly as possible", but that "we can't put one program ahead of all the others." Synthetic rubber, high-octane gasoline, escort vessels, aircraft, and merchant shipping are classed as top-ranking programs. On the contrary there is a very good reason why equipment for synthetic rubber and also aviation gasoline plants should be given a preference rating over the other programs. Equipment once obtained and installed in these plants would represent a demand satisfied for a considerable time as compared with equipment used for escort vessels, aircraft, or merchant shipping which is in continual demand for these programs because of losses from enemy action.

The plant construction program is already behind schedule by as much as six weeks in some cases, and unless stronger support is given it may drop still further behind. It is very probable that even the copolymer plants that have been completed are still operating below capacity because of lack of an adequate supply of raw materials, particularly butadiene. Further delay will mean that during the year 1943 we will come closer to scraping the bottom of the barrel of our rubber supplies than was indicated would be safe in the Baruch Report and in the recent progress report of the Rubber Director.

The WPB on January 27 announced a plan to rationize industry with special reference to those industries manufacturing valves, heat exchangers, control instruments, etc., in order to increase the production of these items. Such a plan when it is worked out may be very effective, but the need of these parts was acute several weeks ago, and it is hard to see how the plan will provide any immediate relief for another several weeks. If the synthetic rubber plant construction program falls as much as three months behind the scheduled completion dates, it will become increasingly possible for the "military and civilian collapse" mentioned in connection with the rubber situation in the middle of 1942 by the Baruch Report to take place by the middle of 1943.

The final decision as to whether or not the demands for equipment for the construction of the synthetic rubber plants will be met on an equal or preferred basis, as compared with the other urgent programs, may depend on the White House now that President Roosevelt has returned from the Allied War Conference. His decision will undoubtedly require a review of the present situation by the Baruch Committee as was suggested in this column last November.

In addition to the extreme importance, first to the whole war effort of completing the construction of the synthetic rubber plants as nearly on schedule as possible, there is a second factor of importance to the rubber industry directly, of the necessity of increased production of synthetic rubber. Without an adequate supply of new rubber of some sort, there would not be much except reclaimed rubber for the industry to use in the manufacture of its products for military as well as civilian use. Although many products can be made from reclaimed rubber or from reclaimed rubber with a small amount of new rubber that will give good service, it would be of considerable military disadvantage to have to make, for example, heavy-duty combat and truck tires under these conditions. The rubber industry realizes these facts better than anyone else, and it is the duty of the leaders of the industry to do everything possible to support the Rubber Director in this situation and also to help Congress and the White House to see the danger in the present trend to subordinate the demands of the rubber program to that of the armed services, even in the light of recent events. Further delay in the plant construction program, which might mean an inadequate rubber supply late in 1943, would be of great disadvantage to these services and to the whole war effort itself.

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What the Rubber Chemists Are Doing

N. Y. Rubber Division, A. S. M. E., Meeting

THE Rubber Division, Metropolitan Section, A.S.M.E., held a dinner-meeting at the Building & Trades Club, 2 Park Ave., New York, N. Y., at which H. W. Fisher, manager of the new Chemical Products Division of the Standard Oil Co. of N. J., spoke on "Engineering Problems of the Synthetic Rubber Program." More than 400 members and guests attended the dinner, and more than 500 were present at the meeting which followed.

The meeting was in charge of A. Weiss, of Allen Billmyre Corp., chairman of the Rubber Division, who introduced Per K. Frolich, director of the Chemical Laboratories, Standard Oil Development Co., and president of the American Chemical Society, who had agreed to act as chairman for the evening. Dr. Frolich preceded his introduction of the speaker of the evening with a brief résumé of the developments in organic chemistry that have led up to the present state of knowledge of the hydrocarbons such as butadiene, isobutylene, styrene, acrylonitrile, etc., some of the ingredients of the synthetic rubbers to be produced in increasing amounts.

Mr. Fisher, referring to Dr. Frolich's explanation of the origin and constitution of synthetic rubber raw materials, stated that in talking to engineers he liked to consider the building up of the large molecules of synthetic rubber as an "assembly job." Using a single molecule of butadiene as a unit, he pointed out that the final large molecule of synthetic rubber consisted of several thousand of these units hooked together. No synthetic rubber was really synthetic in the way that indigo, camphor, etc., were since the chemical formulae of the units or monomers of the synthetic rubbers were different from that for natural rubber. The aim in producing synthetic rubbers has been to obtain substances that would have the same properties as natural rubber even though the chemical formula was not the same. As a result, synthetic rubbers produced during the last ten years have had special properties which make them superior to natural rubber for certain applications. It was the search for synthetic rubbers with new special properties that kept the development work on synthetic rubbers active during the 1920's and 1930's, which has resulted in the United States being as well prepared as it is to undertake the enormous job of replacing the production and technology of natural rubber developed during the last 60 years in the short space of two years.

Mr. Fisher went on to say that two-thirds of the total materials of construction needed for the synthetic rubber plants was required for the raw material plants while the remaining one-third was used in the construction of the copolymer plants. Slides were shown giving the sources of butadiene (petroleum or alcohol), styrene (coal), etc., and listing some of the companies participating in this production as

well as the production of the rubber in the copolymer plants. Data from Progress Report No. 1 of Rubber Director Jeffers showing the relation between synthetic rubber production, our natural rubber stockpile, and consumption during 1943 were given to indicate the urgency of bringing the synthetic production in on time. It has already been admitted that estimated completion dates for plants scheduled for the first quarter of 1943 will not quite be met, and if this situation becomes worse, our rubber supply may not be adequate for our needs.

Because of the transportation problem with butadiene, most of the copolymer plants are being located within a short distance from the butadiene plants. Butyl rubber plants are located near 100-octane gasoline plants since these plants provide the largest supply of isobutylene. The synthetic rubber industry, if completed as planned, will be equal to about one-half the size of the automobile industry in 1939 or the chemical industry in 1940, it was said. There were no unusual problems in connection with the design of the synthetic rubber plants except for the limitations on the use of alloy steels and the fact that structural steel in many cases had to be replaced by concrete. Scarcity of alloy steel was particularly unfortunate with Butyl rubber plant design since the polymerization is carried out at -150° F. However satisfactory substitute materials were found.

Synthetic rubber polymerization requires that the raw materials be of a high state of purity, and this fact had to be considered in plant design. Mr. Fisher pointed out that most of his information was based on contact with design of Butyl rubber plants and butadiene plants; therefore his remarks on design and construction, when applied to other-type plants, should be considered as opinions rather than facts. Slides illustrating some of the details of construction of Butyl rubber plants were shown. It was pointed out that as far as the petroleum industry was concerned, the volume of oil required for the production of synthetic rubber raw materials actually amounted to only about 1% or 2% of the total oil handled in any one year.

The biggest problem in the construction of synthetic rubber plants has been actual equipment procurement. "Priority inflation" has required higher and higher ratings, but even then equipment could often not be secured except by following up through several sub-contractors to find the cause of the delay. Some improvement in this situation has recently become evident through the efforts of Mr. Jeffers, but the problem is still far from being completely solved.

In conclusion, Mr. Fisher mentioned that even with increasing production of synthetic rubber, the problem of the best methods of processing is still a major one; and al-

though intensive work is being done, there will probably be many changes in the technology of the use of synthetic rubber as more and more of it is actually used in production of rubber products.

The color movie with sound, "Bouncing Molecules" was shown after Mr. Fisher's talk.

Continuation of the discussion of the subject of synthetic rubber by various members of the audience with the speaker at the conclusion of the meeting gave evidence how well the talk was received and how great was the interest of the audience in the subject.

The next meeting of this Rubber Division of the A.S.M.E. will be held in the fall.

New Organic Alkyl Peroxide

THE availability of commercial tertiary butyl hydroperoxide was recently announced. This formulation of tertiary butyl hydroperoxide, $(\text{CH}_3)_3\text{C}(\text{O})\text{O}(\text{H})$, appears ideally adapted for use as a catalytic agent in one or two phase polymerizations, as an oxidation agent for laboratory purposes, as a drying accelerator in oils, paints, varnishes, etc., as a combustion accelerator in heavy fuel oils used in diesel engines, as a bleaching agent for cotton, wool and other fabrics, and for numerous other uses. This substance is an unusually stable liquid with an active oxygen content of 17.8% (at 100% concentration) which can be handled and shipped in large quantities without danger of explosion from shock. It is soluble in many common organic solvents (alcohol, ether, ketones in general, esters, aromatics and petroleums), slightly soluble in water, and comparatively stable in the presence of various alkalies and acids. Commercial tertiary butyl hydroperoxide is standardized at a concentration of 50-60% (10% available oxygen). Union Bay State Company, Laboratory "T-18", 50 Harvard Street, Cambridge, Mass.

Two Thiuram Accelerators

E. I. DU PONT DE NEMOURS & CO., INC., Wilmington, Del. is now marketing Thiuram M (tetra methyl thiuram disulphide), identical with Tuads, and Thiuram E (tetra ethyl thiuram disulphide). Thiuram M is stated as being a stronger accelerator for natural rubber than Thiuram E, but the latter has a slight advantage when used in neoprene. Also Thiuram E is sometimes recommended as a plasticizer for Neoprene KNR where soft compositions are required, and this accelerator in conjunction with Accelerator 552 is very effective in reducing the plasticity of Neoprene KNR to a substantial degree.

The patent on Tuads, the tetra methyl disulphide, expired in October, 1942.

A. C. S. Spring Meeting Transferred to Detroit

THE Spring, 1943, (105th) Convention of the American Chemical Society has been transferred to Detroit, Mich., from Indianapolis, Ind., because of inadequate housing facilities there. The convention dates are April 12-16, with meetings of the Division of Rubber Chemistry, April 15 and 16, with headquarters at the Book Cadillac Hotel. Other recommended hotels are the Statler, Detroit Leland, Tuller, and Fort Shelby. Members are urged to make reservations at once and utilize hotel rooms to capacity. Reservations should be addressed to Arthur Rautenberg, Chairman, Housing Committee, A. C. S., 1005 Stroh Bldg., Detroit.

Technical sessions of the Rubber Division—and this will be a serious war meeting of the A. C. S. with no plant trips and a minimum of entertainment—will be held

in the Masonic Temple. Although no formal symposium is being planned, the principal theme again will be synthetic rubbers. Members are urged to submit papers on any topic relating to rubber technology. Deadline for submitting to the Office of the Secretary (H. I. Cramer, Sharples Chemicals, Inc., 23rd and Westmoreland Sts., Philadelphia, Pa.), the 200-250-word abstract in triplicate is February 15. Because every paper on synthetic rubber is subject to censorship before presentation, complete manuscripts, in triplicate, must be in the Secretary's hand no later than March 22. At least one author of each paper must belong to the A. C. S.

The Rubber Division banquet will take place April 15 in the main ballroom of the Book-Cadillac Hotel.

Rubber Reserve Co. Circular No. 13

Symbols Designed for Use in Identifying Types of Synthetic Rubber

In order to effectuate a uniform policy with respect to the use of terms describing the various types of synthetic rubber produced in Government owned plants, the following symbols have been adopted:

Symbol	Source	Common Name
GR-S	Styrene	Buna S
GR-P	Polysulphide	"Thickols"

Symbol	Source	Common Name
GR-M	Monovinylacetylene	Neoprene
GR-I	Isobutylene	Butyl

In the future, therefore, all references to the various types of synthetic rubber shall be made by the use of the symbol only instead of the common name.

January 8, 1943

Resin R6-3—Modifier and Extender for Synthetics

RESIN R6-3, described as a completely polymerized resinous compound, was perfected two years ago and is now being produced on a full-scale commercial production basis by the Resinous Products & Chemical Co. It is supplied as a dark brown, slightly tacky material which is readily consolidated to a sheet on the mill. The resin is oil resistant, and its use in synthetics does not detract from their superiority in this respect. When used in a typical Buna S-type tread stock, the incorporation time on the mill is extremely short, and the stock so produced is admirably suited for calendering, extruding, or tubing. It also improves the flow characteristics of stocks designed for molding. No retarding or accelerating effects

on normal cures have been found. The outstanding properties of stocks containing Resin R6-3 are, however, their excellent resistance to solvents and their stability in high temperature service.

This resin is compatible with Buna S, the "Thickols," and the neoprenes and may be used with these synthetics to extend them or to function as a plasticizer. The material is also compatible with reclaim and exhibits compatibility with natural rubber over fairly wide limits.

It is stated that Resin R6-3 is reinforced by the addition of carbon blacks, and compounds suitable for special applications such as coated fabrics, gaskets, etc., have been prepared in which synthetic rubber constituted only 30% of the total compound.

Montreal Group Meets

THE January 8th meeting of the Rubber & Plastics Division of the Society of Chemical Industry, Montreal Section, was held at the McGill Faculty Club and was designed to acquaint the rubber technologists with plastic molding and the plastic molders with rubber processing. John Beaudry, of the Dominion Rubber Co., discussed the complete handling of rubber from the *Hevea* tree to the finished product. Slides of the machinery used in rubber processing were also shown during the

course of his talk. H. J. McCready, of Hale Bros., the second speaker, described all types of plastic molding for thermoplastic and thermosetting resins and gave interesting details about the design and manufacturing of molds.

The next meeting is scheduled for February 12 and will be addressed by Dr. W. Galley, of the National Research Laboratories in Ottawa, on the subject of "Modern Developments in Adhesives." An expert on adhesives, Dr. Galley will discuss the latest developments in adhesives for plywood.



Herman Jordan

New Rubber Group Formed

THE first meeting of the recently organized Northern California Rubber Group, 1515 Powell St., Oakland, Calif., was held December 8 with 50 members in attendance, including representatives of all the rubber companies, chemical houses, and allied industries in that section of the country. Speaker of the evening was Ross Morris, chief rubber technologist, Rubber Laboratory, Navy Yard, Mare Island, Calif., who discussed "The Effect of Solvents upon Synthetic Rubbers."

Election of officers also took place, with the following results: president, Herman Jordan, Pacific Coast representative of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; vice president, Leonard Boller, Pioneer Rubber Mills, Pittsburgh, Calif.; and secretary-treasurer, George B. Farwell, Reliance Rubber Co., Oakland.

This new organization plans to hold monthly meetings at which technical papers will be read and discussed.

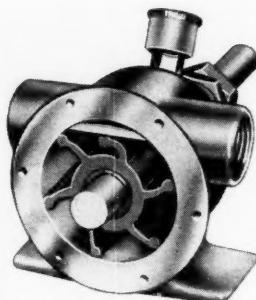
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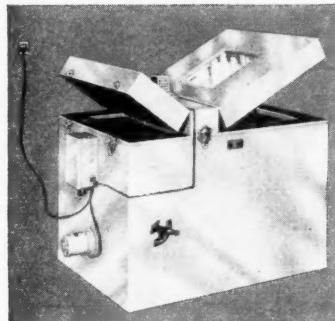
New Machines and Appliances



Jabsco Coolant Pump

Jabsco Pump

A NEW type of self-priming pump with but one moving part and designed to pump either thick or thin liquids is now being marketed. The pump is extremely simple in construction and operation—a single neoprene synthetic rubber impeller is the only moving part. There are, therefore, no gears to wear, clog, or become noisy, and the unique construction guarantees a high vacuum that eliminates priming difficulties. According to the manufacturer, the neoprene impeller allows a certain amount of solids to pass through without clogging and a special heat resisting synthetic rubber is available for extra-hot liquids. By removing the faceplate the impeller may be easily and quickly replaced. All parts except the impeller are bronze. The pump is particularly adaptable to fields wherein pressure requirements are low. Mounted at any angle the pump can operate in either direction. It is available in $\frac{1}{4}$ - to $\frac{1}{2}$ -inch sizes with capacities from $\frac{1}{2}$ to 22 gallons per minute. Jabsco Pump Co.



Aminco Constant Temperature Dry-Ice Cabinet

compartment (75-pound capacity) is heavily insulated from the working chamber.

In the low-temperature model close temperature control is made possible by means of a thermoregulator, which, through a solenoid and an electronic relay, operates a damper that allows air to be passed over the dry ice when cooling is needed, or to be bypassed when cooling is not needed. The temperature control system requires only natural heat leakage for its operation. No electric heaters are used in this model to control the temperature. In the high-and-low temperature model the control described above is augmented by the installation of electric heaters operated through a relay. More complete details are given in manufacturer's bulletin No. AW-2111. American Instrument Co.

New Air Driven Heavy-Duty Stirrers

A NEW line of air driven heavy-duty stirrers especially adapted for the mixing of paints, chemicals, high explosives, or inflammable compounds has been announced



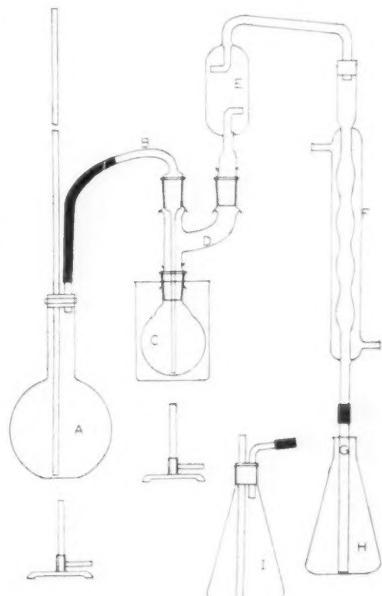
New Air Driven "Lightnin'" Mixer

by the Mixing Equipment Co., Rochester, N. Y. Two of these stirrers are equipped with gear reducers; while the third is a larger direct-drive model. The air driven motors used cannot be overloaded or burned out, and even with the heaviest liquids they will not stall. The air exhaust from the motor is so arranged that it keeps the motor running cool at all times. Models of 1 h.p. and $1\frac{1}{2}$ h.p. are available. The motor speed on all models is 1800 r.p.m., which is reduced to about 400 r.p.m. on the models equipped with gear reducers. Shaft length is adjustable, and shaft and propellers may be made of stainless or plain steel, Monel metal, bronze, etc., as desired.

Apparatus for Rubber Analysis

SPECIAL laboratory equipment for use in a method for the direct determination of the rubber hydrocarbon has been announced. The lack of a practical method for the direct determination of rubber has made it customary to estimate rubber in rubber products by difference, a procedure open to considerable errors of summation and interpretation. The new direct procedure, which will be described in detail in an early issue of the *A.S.T.M. Bulletin*, is applicable to natural rubber, vulcanized

(Continued on page 494)



- A. STEAM GENERATING FLASK, 1000ML
- B. STEAM TUBE, 3/4" 40 JOINT
- C. DIGESTION FLASK, 300ML
- D. CONNECTING TUBE, 3/4" 40 JOINTS
- E. CONNECTING BULB, 3/4" 40 JOINT
- F. CONDENSER
- G. ADAPTER
- H. RECEIVING FLASK, 500 ML
- I. AERATION ASSEMBLY

Apparatus for Direct Determination of Rubber Hydrocarbon

UNITED STATES

Rubber Specifications Again Changed; Other WPB Rulings

Revision of the rubber control orders, M-15-b and M-15-b-1,¹ was announced December 28. M-15-b-1 sets up complete specifications for the manufacture of 31 classes of products. Numerous changes have been made in these regulations and manufacturers are advised to study the revised order thoroughly. The changes in M-15-b are designed to reduce unnecessary paper work, to clarify certain definitions, and to correct other minor points. Major changes follow:

1. To permit the importation from Canada of rubber products manufactured in Canada, in the United States or in the British Isles. As Canada has placed stringent restrictions on the manufacture and disposition of rubber products, free movement across the border will eliminate a great deal of paper work without providing a loophole for evasion of regulations.

2. To permit the importation of bicycle tires mounted on used bicycles included in the personal effects of any person entering the United States. More than 100 cases of this kind have required individual handling. As bicycle tires are not rationed within the country, there is no reason why they should be stopped at the border.

3. To permit the importation of rubber products by diplomatic representatives of foreign governments or members of their staffs for personal use.

4. To permit the importation of scrap rubber by the Army, Navy, or Maritime Commission.

5. The monthly report form, PD-322 according to the order before revision, is changed to Form PD-649. The latter already is in use.

6. The definition of latex is changed from "rubber solids" contained in liquid latex to "dry latex solids" contained. The latter is more easily determined and is the same for all practical purposes.

7. Revision of language to permit fixing of quotas of reclaimed or scrap rubber for groups of products in Schedules II-A and II-B for those who do not request or are not granted crude rubber or latex for such purposes.

8. Substitution of the word "regulations" for "specifications" throughout the order.

Several other changes in language are made in the amended order, as well as a number of changes in the attached schedules.

Correction 1 to M-15-b-1, issued January 1, makes a change in a listing for high-pressure landing wheels.

Amendment 1 to M-15-b, issued January 8, provides that reports covering the consumption of crude rubber, latex, reclaimed rubber, and scrap rubber to fill war orders be filed monthly on Form PD-49, as revised, pursuant to the requirements of paragraph (c) (24) of Order M-15-b.

¹Copies of these revised orders may be had from the Rubber and Rubber Products Division, War Production Board, Washington, D. C.

Supplementary Order M-15-g—Rubber Tires for Industrial Power Trucks—issued January 15, decrees that "no person shall sell, lease, rent, deliver or otherwise transfer, or purchase, accept or otherwise acquire any new rubber tire used or designed for use on any industrial power truck except under a purchase order rated A-1-a or better on a Preference Rating Certificate PD-1A" except in the case of war orders or the use of the tire as original equipment. Necessary records must be kept subject to audit and inspection by the WPB. An industrial power truck is defined as "any self-power-propelled industrial truck or wheel tractor designed primarily for handling material . . . on floors or paved surfaces in and around industrial plants, warehouses, docks, shipyards, airports, or depots." The term does not apply to tractors designed for use on tax-built highways or in such operations as construction, earth-moving, mining, logging, industrial yard work, or petroleum development.

General Limitation Order L-61—Tire Retreading, Recapping and Repair Equipment—was amended December 23, 1942, and again on January 18, 1943. Points covered are ratings of purchase orders, preference rating certificates required, certain exceptions to the order, and limited inventory of parts on hand.

Non-Rubber Tape Found Useful

To conserve vitally needed crude rubber the Conservation Division urged the use of non-rubber adhesive tape for masking plastic airplane glass to prevent scratches or damage during shipment. Crude rubber pressure-sensitive tape, which consumes thousands of pounds of crude rubber monthly, has been used for this purpose.

High-grade reclaim rubber pressure-sensitive tape was first suggested as a slightly less critical alternate, but was found unsatisfactory because a residue remained on the glass after the tape was removed, requiring the use of a solvent which reacted with the plastic glass. Next exhaustive tests of non-rubber pressure-sensitive tape of vegetable oils and resins proved this tape satisfactory for the purpose.

Recommendations for the substitution of the non-rubber tape for masking plastic airplane glass were made by the Conservation Division in view of the satisfactory results of the tests. This use of the non-rubber tape will make the crude rubber formerly used for this purpose available for other essential war production. Other military uses for this non-rubber tape are: to guard against the damaging effects of moisture, all apertures of tanks, planes, and small arms shipped overseas are sealed with the tape in transit; to prevent loss pending assembly, unassembled parts of machines are grouped and held together with the tape. This tape also is used on a large scale for masking surfaces to be painted, replacing

the high-grade reclaim rubber tape previously used.

Organization Changes

Curtis E. Calder, Assistant Deputy Director General for Industry Divisions, on January 19 was appointed Director General for Operations to succeed Ernest Kanzler, who resigned because of ill health. Mr. Calder is president of American & Foreign Power Co., Inc.

James S. Knowlson has resigned as WPB vice chairman to resume his duties as president and chairman of Stewart-Warner Corp., Chicago, Ill., but will be available to the WPB as a special consultant.

The Conservation Division has been reorganized. The new Conservation Division, with Howard Coonley as director, consists of three technical branches: Conservation and Substitution, Simplification, and Specifications; these with four salvage branches comprised the original Division. The four branches now comprise a Salvage Division under Director Paul C. Cabot. Creation of this new division followed the resignation of L. J. Rosenwald as director of the old Conservation Division.

Six new claimant agencies have been created to present claims for critical materials to the WPB: Office of Rubber Director, NHA, ODT, Petroleum Administration for War, Food Administrator, and Facilities Bureau of the WPB. These agencies will have representation on the Requirements Committee, will act as spokesmen for the various "customers" using critical materials, and are responsible for making up and presenting their respective programs and compiling requirements of materials to meet them. This work is being done both for current and future requirements to be submitted under the Controlled Materials Plan when it becomes effective April 1.

Creation of the Office of Power Director with the appointment of J. A. Krug as its head to take over complete responsibility within the WPB for electric power, gas, water, and communications was announced January 22. The OPD will include the former WPB Power Division and the Communications Equipment Division. Also transferred to the Office are the functions and responsibilities of the Facilities Bureau and the Resources Agencies, insofar as they deal with electric power, gas, water and communications.

C. S. Williams has been made director of the Controlled Materials Division, and Richard N. Johnson director of the Consumer Goods Division, both in the Office of Civilian Supply.

J. E. Hutchman has been transferred from the Office of Civilian Supply to the Office of the Rubber Director, where he will be responsible for the evaluation and development of numerous synthetic rubbers.

and rubber substitutes which are outside the established government program, as part of the general program on synthetics being conducted under the direction of R. P. Dinsmore, Assistant Deputy Rubber Director, in charge of research and development of synthetics.

F. Higginson Cabot has been named chief of the Commodities Bureau to succeed Ernest W. Reid, now Assistant Deputy Director General for Industry Divisions.

R. A. Maxwell, with The B. F. Goodrich Co., Akron, O., since 1933 and lately in the war products department of the company's national sales and service division, has joined the Requirements and Capacities Section, Rubber Branch, WPB.

The Industrial Salvage Branch of the Salvage Division has organized a salvage committee in the rubber goods industry under the chairmanship of E. W. Stearns, president, Parker-Stearns & Co., Brooklyn, N. Y., for the greater New York area. Mr. Stearns has selected the following executive committeemen to assist him: J. S. Michtom, vice president, Ideal Rubber Co., Inc., Brooklyn, Townsend Cocks, secretary, Elmhurst Rubber Co., Inc., Elmhurst, L. I.; George L. Peters, president, Peters Bros., Rubber Co., Inc., Brooklyn; Richard C. Moore, assistant to the vice president, Vulcan Proofing Co., Brooklyn. The industry program consists of locating, collecting, segregating, and disposing of all types of critical materials as iron and steel, non-ferrous metals, rubber, burlap, manila rope, obsolete machinery, tools, dies, jigs, and equipment, and has been organized under the supervision of R. Merrill Decker, regional chief, Industrial Salvage Branch, Region 2 WPB, and A. Boyd Zook, senior industrial specialist. The first report of the committee showed a total collection of 224,203 pounds of scrap, of which 166,913 pounds were rubber for a period during the last quarter of 1942.

Additional Restrictions

Conservation Order M-104, as Amended December 23, 1942 — Closures for Glass Containers and Amendment 1, issued January 1,—contain further restrictions upon the manufacture, sale, delivery, purchase, and use of such closures. The order was further amended January 1, 1943.

Limitation Order L-20, as amended January 4, 1943 — Cellophane and Similar Transparent Materials Derived from Cellulose—revises the order restricting the use of cellophane, etc., for packaging, sealing, or manufacturing many commodities, including "all rubber and rubber products, but not including use as a substitute for Holland Cloth in the backing of retreading stocks for tires, as a protective cover for cement on tire refineries and patches, and as a wrapping on friction and rubber tape."

General Limitation Order L-39 was amended January 20, 1943, to include signal and alarm as well as fire protective equipment. The use of crude or reclaimed rubber is confined to diaphragms, gaskets, and lining for cotton rubber lined hose, and reclaimed rubber for hose for fire extinguishers. Synthetic rubber other than neoprene may be used only to the extent essential to efficient functioning.

Limitation Order L-180 as Amended January 5, 1943—Materials Entering into the Production of Replacement Storage Batteries for Passenger Automobiles and Light Trucks, Medium and Heavy Trucks, Truck Tractors, Truck Trailers, Passenger Carriers and Off-the-Highway Motor Vehicles—further defines "automotive replacement storage battery" and "producer" thereof and sets additional restrictions on the production of such batteries and on inventories.

General Limitation Order L-234—Industrial Type Instruments—issued December 24, places under WPB control pyrometers, temperature instruments, differential flow and liquid level instruments, industrial thermometers, pressure gages, control valves, and regulators.

General Preference Order M-30—Ethyl Alcohols and Related Compounds—was amended January 7, 1943, giving additional restrictions on the use and delivery of these products.

General Preference Order M-153 as Amended January 9, 1943, sets further restrictions on the use and delivery of acrylonitrile and gives specific instructions on applications and reports.

Preference Order M-154 as Amended January 9, 1943, defines thermoplastics, and limits their use by listing 106 products in which thermoplastics may not appear.

General Preference Order M-170 as Amended January 9, 1943, is devoted to restrictions on the use and delivery of styrene and to directions for applications and reports.

General Preference Order M-178 as Amended January 9, 1943, relates essentially to curtailments of the delivery and use of butadiene and instructions regarding the filing of applications and reports.

In an attempt to put every usable electric motor in the United States to work on the war effort the WPB appeals to every manufacturer with idle motors to make them available for sale and to all manufacturers to use their motors to best advantage and for as long as possible. The recently issued General Conservation Order L-221 is designed to encourage maximum use of existing motors and to conserve materials in future production.

The Chemicals Division, pointing out that the critical shortage of metals and rubber for military purposes makes imperative utilizing every possible substitute material, has requested the molded plastics industry to pool its available machinery, production knowledge, and technique to insure adequate facilities for military requirements for molded and extruded thermoplastic parts.

ODT Activities

The Office of Defense Transportation, Washington, D. C., last month announced the resignation of John R. Turney, director of the Division of Transport Conservation, and the conversion of the division into a Staff Division of Review and Special Studies with Charles L. Dearing its director. The new division will have certain special duties relating to passenger auto-

mobiles and the rubber needs of highway automotive vehicles in general, and will also be available to aid ODT Director Joseph Eastman, when special studies are needed, in formulating programs and determining the effectiveness of established programs. The Division will: (a) Have charge of the analysis, requested by the Rubber Director, of the effect of gasoline rationing upon public transportation service; (b) undertake such special studies as are assigned to it by the Director of Defense Transportation; (c) advise the Director of changes in the supply situation with respect to motor fuel and rubber, and keep him informed of the general condition of highways as they may affect domestic transportation; (d) determine the requirements of privately owned passenger automobiles for rubber and repair parts.

Effective January 1, fleet operators of commercial motor vehicles transporting passengers need not maintain tire records on each vehicle's Certificate of War Necessity. Operators must, however, continue to keep tire records for each vehicle, and these records must be available for examination by the ODT at all times.

The ODT on January 12 postponed the final date for initial commercial motor vehicle tire inspections, as required by General Order ODT No. 21, from January 15 to February 28, 1943. After initial inspection the vehicle must be presented for regular inspections every 60 days or every 5,000 miles, whichever occurs first. All inspections must be made by inspectors designated by the OPA.

On January 19 the ODT exempted under certain conditions, from the tire inspection provisions of the order specified unlicensed and limited-licensed commercial motor vehicles.

The ODT on January 14 called a meeting in Washington of street traffic experts to consider how traffic lights may be adjusted to wartime conditions to eliminate waste of rubber, fuel, and manhours.

The ODT recently issued a series of orders (ODT 27-32) relating to the use of motor vehicles in Puerto Rico in an effort to conserve and fully utilize transportation equipment, material, and supplies, including rubber. Tire loads are listed in detail.

ODT regulations governing inter-city bus operations are saving more than 14½ million tire miles monthly, based on six tires to a bus.

The War Department, Washington, D. C., has announced that salvage materials including tires, tubes, scrap rubber, and other miscellaneous items are being collected at overseas Army bases and returned here for further use. If disposal in foreign areas is essential to the prosecution of the war, however, such materials will not be returned. Unsatisfactory tires and tubes are inspected and classified overseas as: tires capable of being repaired or retreaded, and tubes, irrespective of condition; tires unsuitable for further use and scrap rubber; tires and tubes pertaining to aircraft and to special-purpose vehicles procured by the Army Air Forces, regardless of condition.

Price Rulings Released on Druggists' Sundries and Synthetic Rubber;

Other OPA News

Two new regulations: MPR 300—Maximum Manufacturers' Prices for Rubber Drug Sundries—and MPR 301—Retail and Wholesale Prices for Rubber Drug Sundries—issued January 18 and effective February 1, establish maximum prices for these products at all distribution levels. Ceilings for the Victory line (hot water bottles, combination syringes, ice caps and bags, and invalid rings produced after January 31, 1943, meeting minimum standards set by the WPB) are specified in dollars and cents, and manufacturers must stamp the maximum retail price of each item on the article itself or on the container in which it is sold to the public except those goods sold to mail-order houses, which must be marked either with the ceiling price or the letter "V." Rubber druggists' sundries other than the Victory line shall be marked either with an "R" or the maximum retail price. Manufacturers' ceilings on these sundries are frozen at December 1, 1941, levels. Formulas also are given whereby wholesale and retail maximum prices can be calculated.

The regulations, moreover, require sellers to keep certain records for OPA inspection and compel manufacturers to file reports on the maximum prices (except for the Victory line) for all rubber druggists' sundries produced on February 1, 1943, the methods used to determine these prices, and the discounts, allowances, and other price differentials in effect for the items on December 1, 1941; and to file reports showing each brand name used for colored and black Victory-line hot water bottles, to be filed by the manufacturer within 15 days after he starts production.

Although the General Maximum Price Regulation, which established the highest price charged during March, 1942, as the ceiling, governed sales of rubber druggists' sundries, the OPA explained that MPR 300 and 301 were necessary because of the creation of the Victory line and the rapid introduction of synthetics.

Regulations Affecting Prices of Synthetic Rubber

Amendment 49 to Supplementary Regulation No. 1 to GMPR, issued December 31, 1942, and effective January 6, 1943, defines synthetic rubber exempt from price control¹ and frees reclaimed synthetic rubber of price control in order to facilitate development of a new industry vital to the war effort. Heretofore synthetic rubber has been included in a list of commodities, to which reclaimed synthetic rubber is now added, exempt from price control, but an official statement of what synthetic rubber is considered to be has been lacking. It is now defined to mean:

"A material obtained by chemical synthesis, possessing the approximate physical properties of natural rubber, when compared in either the vulcanized or unvulcanized condition, which can be vulcanized

with sulphur or other chemicals with the application of heat, and which, when vulcanized, is capable of rapid elastic recovery after being stretched to at least twice its length at temperatures ranging from 0 degree F. to 150 degrees F. at any humidity."

The new definition "is the result of much study on the part of the Office of Price Administration and discussions with representatives of the War Production Board, the Rubber Director's Office, and the rubber industry," OPA said. The same definition is being incorporated also into Revised Supplementary Regulation No. 11—Exceptions for Certain Services—under which the service of converting raw materials supplied by the customer into synthetic rubber is excepted from price control. Amendment No. 11 to that regulation, effective January 6, 1943, substitutes the new definition of synthetic rubber for the one heretofore contained in supplementary Regulation 11.

The decision to exempt reclaimed synthetic rubber from price control, OPA said, is based on the same reasons which caused such rubber in its original form to be exempted. Important among these reasons is the fact that the reclaiming of synthetic rubber is a new industry, and it is desirable that development of various reclaiming techniques be free of price restrictions during the formative period. It is expected, OPA added, that lower prices will go along with increased experience, and in any case price control will be imposed when conditions warrant. At the moment, it was pointed out, volume is small; therefore prices of rubber products will not be disturbed because of the absence of price control over reclaimed synthetic rubber.

Amendment 50 to SR 1, effective January 23, exempts dehydrogenation catalysts and catalyst carriers from price control when sold for use in the manufacture of synthetic rubber.

More Decrees Relating to Rubber Goods

Amendment 2 to MPR 220—Certain Rubber Commodities—issued December 29, 1942, and effective January 4, 1943, adds to the regulation whereby manufacturers determine maximum prices for new lines of rubber products a specific list of articles, including for the first time, goods made of rubber substitutes.

"Substitute rubber" is defined in the amendment to mean "a substance made in whole or in part by a chemical process or from natural gums, resins or oils which in physical properties sufficiently resembles natural or synthetic rubber to replace either of them for particular uses including uses where only some and not all of the physical characteristics of natural or synthetic rubber are needed, and which serves the same use as natural or synthetic rubber in the particular application in which it is applied."

So as to define the regulation's scope more clearly, the amendment lists the articles which, when made in whole or in part of rubber, shall be governed by Regulation 220. The regulation specifically

provides that it shall not apply to commodities for which a maximum price is in effect under the provisions of any other price regulation, other than the General Maximum Price Regulation, issued, or which may be issued, by the OPA. Manufacturers selling the articles listed are advised by the Amendment to make sure, before pricing their products in accordance with Regulation 220, that the articles are not covered by other regulations.

Specifically, but not exclusively, the amendment is not applicable to commodities for which maximum prices are established by the following:

Maximum Price Regulation No. 136—Machines and Parts, and Machinery Services; Maximum Price Regulation No. 157—Sales and Fabrication of Textiles, Apparel and Related Articles for Military Purposes, and Maximum Price Regulation No. 188—Manufacturers' Maximum Prices for Specified Building Materials and Consumers' Goods Other Than Apparel.

Articles listed in Amendment No. 2 follow:

1. The following items of apparel: aprons, bathing supplies (including bags, belts, capes, coats, shoes, and bathing suits), brassieres, corsets, dress shields, garters and armbands, girdles and elastic girdle blanks, make-up capes, ponchos, raincoats and rainsuits, suspenders, and waterproof capes, cloaks, hats, jackets, leggings, overalls and sleeves.

2. Bicycle tires and tubes.

3. Cements and adhesives made in whole or in part of natural, synthetic, reclaimed, or balata rubber, but not substitute rubber.

4. Coated fabrics, including, but not limited to, artificial leather, automobile upholstery, awning cloth, backing cloth, gummed sign cloth, hospital sheeting, raincoat cloth, rubber webbing, rubberized canvas, shoe fabrics, "suede" fabrics, tire covers, topping, and winter fronts.

5. The following latex and latex covered products: backing of carpets, jute bags, rugs, sacks and wallpaper, and baskets, buckets, dippers, frames, funnels, measures, racks, screens, sponge upholstery, and traps.

6. The following items of stationer's goods: chair cushions, desk angle protection strips, desk tops, erasers, pen sacks, pencil plugs, rubber bands, rubber stamps, telephone cord guards, telephone ear pieces, telephone stands, typewriter feet, and typewriter keys.

7. Tire repair materials.

8. The following miscellaneous items: air bags and curing tubes used in vulcanizing tires and repairing tubes; balloons for radio and weather observations; cable wrapping tape; diving suits; elastic webbing; mechanical rubber goods made in whole or in part of balata, the rubber content of which is more than 50% balata; rubberized curled hair, shower-bath curtains, and tarpaulins.

Amendment 48 to Supplementary Regulation No. 1, GMPR, issued December 31, 1942, but effective December 19, exempts from GMPR "sales or deliveries of balata rubber by Rubber Reserve Co., and deliveries, whether made by Rubber Reserve Co. or other sellers, of balata rubber when delivery is pursuant to a sale which, when made, was exempt from the General Maximum Price Regulation."

Amendment 3, MPR 143—Wholesale Prices for New Rubber Tires and Tubes—issued January 6 and effective January 12, provides an alternative pricing method for manufacturers of passenger-car tires of reclaimed rubber (war tires) for use where the previously established pricing method does not allow a sufficient operating margin.

Amendment 4, MPR 200—Rubber Heels, Rubber Heels Attached and Attaching of Rubber Heels—issued January 11 and effective January 16, prices for domestic sale

¹ Except for GR-S (Buna S) and GR-M₂ (neoprene), Rubber Reserve Co. Circular No. 9, Sept. 28, 1942 (INDIA RUBBER WORLD, Dec., 1942, pp. 295-96). EDITOR.

at all levels from manufacturer to consumer rubber heels made to specifications of government procurement agencies, but rejected by them because of defects that have no effect on their serviceability.

Amendment 5, MPR 229—Retail and Wholesale Prices for Victory Line Water-proof Rubber Footwear—issued December 23 and effective December 29, 1942, provides that sellers shall not require purchasers to pay a larger proportion of transportation costs in the delivery of such footwear than was required in the delivery of similar footwear during April 1 to October 25, 1941, for wholesale sales and July 1 to October 25, 1941, for retail sales.

Amendment 5, MPR 149—Mechanical Rubber Goods—issued December 24, but retroactive to October 31, 1942, relates to maximum prices for certain horseshoe pads made by the Dryden Rubber Co.

Order 186 under 1499.3(b) of GMPR, issued December 22 and effective the next day, sets forth prices the Dow Chemical Co., Midland, Mich., may charge for certain "Saran" products.

Order 198 under 1499.3(b) of GMPR sets prices effective January 2, at which Continental Can Co., Inc., may sell rubber collection cups fabricated from zinc plated steel sheet to the Rubber Reserve Co.

Dealers in retreaded and recapped tires who do not possess their own equipment and must have the work done outside may not pass on to their customers resulting transportation charges, the Office of Price Administration ruled recently.

Tire Rationing

OPA, after consultation with the Office of Rubber Director, announced a program to make tires accumulated under the Idle Tire Purchase Plan ready for the essential use of average car owners. Purpose of the program, effective January 20, is to keep necessary civilian automotive transport moving by building up in tire dealers' establishments stocks of used, repaired, and recapped tires for speedy transfer to essential passenger cars as need develops under the national mileage rationing program. The announcement said principal applicants for these tires will be holders of A and B gasoline rationing cards who can prove essential need of replacement tires. The new program permits repairmen and recappers to maintain 24-hour operations by obtaining allotments of tire casings, without waiting for tires to come to them from motorists or trade channels.

Some 10,000,000 automobile tires were donated or sold to the government up to the final December 12 deadline, under the Idle Tire Purchase Plan.

Amendment 5, Ration Order 1A—Tires, Tubes, Recapping and Camelback—issued January 9 and effective January 20—announces a new plan to route tires in need of attention to dealers equipped to do a repair or recap job and also arranges for the distribution to dealers, for resale, of usable tires accumulated under the Idle Tire Purchase Plan. Amendment 6, issued and effective January 14, makes changes in the periodic tire inspection program to minimize public inconvenience and smooth out occasional work peaks for the qualified in-

spectors. Deadline for the first inspection has been extended from January 31, and subsequent inspections will be less frequent: Class A mileage ration books, deadline March 31, and then within every six-months period thereafter; Class B, February 28, and within every four months period thereafter; Class C or bulk coupons, February 28, and within every three months period thereafter.

Additional OPA Orders

Amendment 7, Ration Order 6—Men's Rubber Boots and Rubber Work Shoes—effective December 26, makes lumbermen who need rubber laced boots for their work eligible for rationing certificates authorizing purchase of this type of footwear. Amendment 8, effective January 13, extends eligibility for rationing certificates to employers who need rubber boots or rubber work shoes for use by employees doing work essential to the war effort, public health, or safety during disasters.

MPR 297, issued January 5, sets maximum prices at which natural resins may be sold.

Amendment 4 to MPR 188—Manufacturers' Maximum Prices for Specified Building Materials and Consumers' Goods Other Than Apparel—effective January 18, transfers from other price measures and brings under control of 188 many more commodities including health, X-Ray, and safety and protective equipment and supplies, certain furniture and marine items, and photoengraving and photocopying apparatus and supplies.

Brown Succeeds Henderson

Prentiss M. Brown, former Senator from Michigan, is now Price Administrator, succeeding Leon Henderson, who recently resigned because of ill health.

Mr. Henderson, on January 20, in his final report on the operations of the OPA, covering the quarter ended October 31, 1942, deals also with an analysis of business profits under price control. Analysis of 1,324 large corporations shows that the average per cent returns on net sales rose from 8.1% in 1939 to 10.3% in 1940, and 13.5% in 1941. Figures for the rubber industry follow: 6.8% in 1939, 7.3% in 1940, and 12% in 1941. Mr. Henderson believes "profits per unit of sales will be substantially higher in 1942 than they were in 1941."

Jeffers Authority Defined

Authority to allot rubber among all claimant agencies, military and civilian, is conferred on Rubber Director William Jeffers in an amendment to WPB Regulation No. 1 signed by Chairman Donald M. Nelson January 9. This order gives Mr. Jeffers complete control over distribution of the nation's rubber supply, including all allocations and apportionments from the rubber stockpile. It also vests in him the power to issue, administer, and, if necessary, to amend or repeal orders regulating the production, distribution, and use of rubber and rubber products; it does not, however, include the authority to control the

distribution of materials used in the production of rubber.

The order states that the Rubber Director shall have the authority:

1. To allot rubber among the War Department, Navy Department, Maritime Commission, Aircraft Scheduling Unit, Office of Lend-Lease Administration, Board of Economic Warfare, Dominion of Canada, the Domestic Requirements Section of the Office of Rubber Director, and any other public or private agency authorized to act as a Claimant Agency before the War Production Board, and also to allot rubber for civilian requirements;
2. To allocate and apportion rubber among the users thereof, including all allocations and apportionments from the rubber stockpile;
3. To issue, administer, and, where necessary, amend or repeal new orders regulating the production, distribution and use of rubber and rubber products, and to amend, repeal and supersede any existing orders heretofore issued by the War Production Board regulating such production, distribution and use, provided, however, that all existing orders of the War Production Board affecting such production, distribution or use shall remain in effect until specifically amended, repealed or superseded. The authority hereby delegated shall not include authority to regulate or control the distribution of any material or products other than rubber and rubber products, even when such other material or products are for use in the production of rubber."

It also is provided that the Rubber Director may exercise these powers either in his own name, through the WPB Director General for Operations, or through such other official, agency, or person as he may designate.

Amendment 2, General Preference Order M-13—Synthetic Rubber—Amendment 2, Supplementary Order M-15-b, as Amended December 28, 1942—Rubber and Balata and Products and Materials of Which Rubber or Balata Is a Component—Amendment 1, Supplementary Order M-15-b-1, as Amended December 28, 1942; Amendment 1, Supplementary Order M-15-c; Amendment 1, Supplementary Order M-15-f; and Amendment 3, General Preference Order M-46—Chlorinated Rubber—all issued January 22, all carry the change that: "Any action which, under the terms of this order" or of any schedules or lists attached to any of the orders is to be taken by the Director General for Operations (or in the case of synthetic or chlorinated rubber, also the Director of Priorities, or the Director of Industry Operations) "may be taken by either the Director General for Operations or the Rubber Director."

Civil Aeronautics Board, Washington, D. C., has issued an order, Amendment 61-3, C. A. Regs., effective January 13, stating that "no air carrier shall dispatch or operate aircraft in air transportation through any known or probable icing condition unless the aircraft is equipped for deicing wings, propellers; and for such other parts of the aircraft as the Administrator may prescribe to assure safety of the flight."

EASTERN AND SOUTHERN

American Cyanamid Plastics Development

The extensive use of Melmac plastics for buttons on cotton garments issued to Army personnel, for dishes for planes and small vessels, and applications in the finishing field are some of the new developments outstanding in 1942 for the American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y. New types of the well-known Rezyl (alkyd) series of resins have been perfected to meet military specifications for protective coatings with reduced amounts of critical china wood oil and phthalic anhydride. New textile coating systems involving Cyanamid's synthetic resins are being developed to meet pressing needs of raincoats and gasproof clothing formerly made with rubber.

New efficiency in producing paper having high wet strength combined with enhanced dry strength and resistance to folding was achieved by the development of a Melmac resin suitable for addition to paper pulp in the beater before the sheet is formed. Applications of high wet strength paper are in producing weather resistant cartons, in bags and wrappings for vegetables and other moist materials, in paper towels, and in blueprint paper where high wet strength is important in fast processing of prints and where fold resistance lengthens the service life of the finished prints.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced that on January 1 the Krebs Pigment & Color Corp., wholly owned subsidiary for the past eight years, was dissolved, and its functions are being carried out by the du Pont Pigments Department. This change of name involves no change in the personnel of the sales, manufacturing, or research divisions, nor will there be any change in the management or policies. The Pigments Department will continue to supply white zinc sulphide and titanium pigments and chemical dry colors to manufacturers of paint, linoleum, ink, leather, coated fabrics, paper, soap, rubber, rayon, shadecloth, ceramics, and other products. Research activities will continue, as heretofore, to be directed toward the development of new and improved white pigments and dry colors.

The du Pont company on January 4 received a special award of honor "for distinguished service to safety" by the National Safety Council, Chicago, Ill. The ceremony took place on the Cavalcade of America radio program and was connected with a nation-wide campaign conducted at the request of President Roosevelt to "save manpower for warpower."

Standard Oil Co., New York, N. Y., on January 6 elected Chairman R. W. Gallagher president and chief executive officer to succeed the late W. S. Farish. No new chairman of the board will be named. Eugene Holman, a vice president and a director, was put on the executive committee.



John H. Ingmanson

Chairman of New York Group

John H. Ingmanson is the 1943 chairman of the New York Group, Division of Rubber Chemistry, A. C. S. He was last year's vice chairman. A native of Sycamore, Ill., where he was born April 9, 1898, Mr. Ingmanson attended the Universities of Illinois and Chicago and received a B.S. in chemistry. He then applied his knowledge of engineering to the beet sugar industry, the operation and development of dyestuffs, and the manufacture of tin foil. Crown Chemical Corp. employed him as works manager for manufacturing intermediates for dyestuffs until Bell Telephone Laboratories, New York, N. Y., attracted him in 1928. Today Mr. Ingmanson is a member of the research group on rubber at Bell Laboratories under A. R. Kemp.

Author as well as engineer, Mr. Ingmanson has written many an article of vital interest to the field of rubber. At present he is chairman of the ASTM Committee D-11 on Rubber. He is a member of F&AM, a Royal Arch Mason, and also belongs to Phi Lambda Upsilon and American Chemical Society, of which he is a very active member. He is also an ardent fisherman and gardener.

Mr. Ingmanson resides at 29 Blackburn Place, Summit, N. J., and has two sons of sixteen and four, respectively.

Commodity Exchange, Inc., 81 Broad St., New York, N. Y., at the annual election January 19 reelected Louis V. Keeler and Charles T. Wilson as governors to represent the Rubber Group of the Exchange for a term of three years.

The board of governors on December 21 elected Philip B. Weld, of Harris, Upham & Co., as president. The following vice presidents also were named: LeRoy G. Scheinler, Rubber Group; R. F. Teichgraeber, Commission House Group; M. R. Katzenberg, Hide Group; P. Gerli, Silk Group; and Ivan Reitler, Metal Group. Floyd V. Keeler was reelected treasurer.

Greetings, Calendars, and Souvenirs

The staff of INDIA RUBBER WORLD gratefully acknowledges the following holiday mementos:

War bond wallets from United Carbon Co., Charleston, W. Va.

Giant ash tray from Rare Metal Products Co., Belleville, N. J.

Perfume from Givaudan - Delawanna, Inc., New York, N. Y.

Memo pad and desk calendar from Pequannock Rubber Co., Butler, N. J.

Pocket memorandum books from Pittsburgh Plate Glass Co., Pittsburgh, Pa., and John Royle & Sons, Paterson, N. J.

Useful calendars from Godfrey L. Cabot, Inc., Boston, Mass.; General Electric Co., Schenectady, N. Y.; Hercules Powder Co., Wilmington, Del.; Link-Belt Co., Chicago, Ill.; H. M. Royal, Inc., Los Angeles, Calif.; Simplex Wire & Cable Co., Cambridge, Mass.; Thiokol Corp., Trenton, N. J.; C. K. Williams & Co., Easton, Pa.; National Rubber Machinery Co., Akron; Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.; Oak Rubber Co., Ravenna, O.; and Advanx Tyre & Rubber Co. Pty Ltd., Sydney, Australia.

Attractive greetings from Eric Bonwitt, Akron; Carter Bell Mfg. Co., Springfield, N. J.; Cleveland Liner & Mfg. Co., Cleveland, O.; Norman Grace, of Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., Canada; Thos. L. Gatke, Gatke Corp., Chicago, Ill.; Carl J. Wright, of General Atlas Carbon Division of General Properties Co., Inc., Pampa, Tex.; I. D. Hagar, of Titanium Pigment Corp., New York; Guy L. Hammond, of Black Rock Mfg. Co., Bridgeport, Conn.; C. J. Harwick, Standard Chemical Co., Akron; Wm. Higgins, of United Carbon; Allyn Brandt, of Philadelphia Rubber Works Co., Akron; Hycar Chemical Co., Akron; Interstate Welding Service, Akron; Fred Traflet, of Pequannock Rubber; J. Holmes, of Polymer Corp., Ltd., Toronto; D. C. McRoberts, of Johns-Manville Co.; Bevis Longstreth, of Thiokol Corp.; James J. DeMario, of Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.; R. E. Powers, of The B. F. Goodrich Co., Akron; Henry L. Scott Co., Providence, R. I.; John A. Britton, Jr., of Standard Oil Development Co., New York; *Rubber Age*, New York; S. C. Stillwagon, Hodgman Rubber Co., Framingham, Mass.; I. Drogin, United Carbon; E. B. Curtis, of R. T. Vanderbilt Co., New York; J. de C. Van Etten, of Vansul & Co., Englewood.

The Rust Engineering Co., Pittsburgh, Pa., has been awarded a contract for brick settings for 20 boilers for a butyl rubber project in the Southwest. To conserve critical materials boilers previously used in an industrial installation in an eastern state will be utilized.

Robert E. Meltz has sold his interest in the Meltz Tire & Rubber Co., New Brunswick, N. J., to the Sidney Michaelson Co. and is devoting his time to Meltz Aircraft, dealer in used airplanes, parts, etc.

U. S. Rubber Developments

Kok-sagyz, the dandelion from which the Russians derive some of their natural rubber, is being harvested in Bergen County, N. J., from seed planted experimentally last July 20 by the United States Rubber Co., 1230 Sixth Ave., New York, N. Y. The planting is one of a number sponsored by the government in many states to determine under what conditions the plant grows to best advantage. John McGavack, of the General Development Laboratories of the company, is in charge of the work. In harvesting, the roots still growing are dug from the frozen ground long after the leaves have been frost killed. Most of the rubber content of *Kok-sagyz* is in the roots. The plant is an annual which yields rubber in from six to twelve months.

H. Gordon Smith, general manager of U. S. Rubber's textile division, has announced Ustex, a new cotton yarn of superior strength, which has been approved by Wright Field for parachute harness. This yarn does not require the long staple cotton now a critical military raw material, but it employs a readily available type that produces a yarn as strong as linen. Orders are in for more than a million and a half pounds, and the company will increase its pilot plant production of 5,000 pounds weekly to many times that figure. The first large unit, authorized by WPPB, will soon be completed at the company's textile mills at Winnsboro, S. C.

Personnel Activities

James W. Harley has been made director of traffic of U. S. Rubber, succeeding George F. Hichborn, who has been with the company for 36 years and will continue in an advisory capacity. Mr. Harley started with U. S. Rubber in 1919 as a factory hand at the Passaic plant. His first important promotion was as traffic manager there in 1923. In 1933 he was made assistant general traffic manager of the company and in May, 1942, general traffic manager.

C. J. Durban was recently appointed assistant director of advertising for U. S. Rubber. Mr. Durban entered the rubber industry in 1927 and joined the U. S. organization in 1937 to merchandise U. S. Royal Master Tires. In 1939 he was made advertising manager for U. S. Tires, and upon acquisition of the Fisk Rubber Co., was appointed to the tire division in a similar capacity in 1940. Mr. Durban will continue to supervise all tire advertising in addition to his broader company duties.

F. B. Davis, Jr., chairman, U. S. Rubber, is a divisional chairman, representing the rubber industry, in the Commerce & Industry Committee of the 1943 Red Cross War Fund drive.

Paul Daley, public relations manager of Alice Mill, the company's plant at Woonsocket, R. I., on January 19 addressed the Woonsocket Kiwanis Club, discussing operations and future prospects of the factory.

Philco Corp., Philadelphia, Pa., as a result of research started several months before Pearl Harbor, has announced a new

line of "Vitrabloc" storage batteries in which the hard rubber jar has been replaced by a vitrified ceramic jar produced entirely from non-critical materials. Well over a year was spent in developing the new jar and getting it into production. Made from a special blend of four clays to obtain density, color, strength, and shrinkage, Vitrabloc has a highly glazed surface inside and out, which does not absorb moisture; acid will not penetrate or affect it. Even when heated to 212° F. and then plunged into ice water, the jar does not contract. Its white surface provides high light reflection to brighten dark battery rooms. The "Vitrabloc" line is reported by the manufacturer as offering the same capacities and virtually all the advantages of the rubber jar battery developed by them about three years ago for telephone and stand-by use.

Board of Economic Warfare, Office of Exports, Washington, D. C., on December 30 released "Current Export Bulletin No. 63", which lists commodities requiring a certificate of necessity, including reclaimed rubber and rubber manufactures, for export to the other American republics.

"Current Export Bulletin No. 69", January 22, on the subject of multiple commodities application, gives a revised list of related commodity groupings, including such products as: rubber, reclaimed and scrap; rubber footwear and materials; druggists' rubber sundries; hard rubber goods; tires and inner tubes; tire repair material; rubber belts, belting, hose, tubing and packing; rubber thread; other rubber and manufactures; tire fabrics; cotton yarn; cotton duck; batteries; automotive parts and accessories; coal-tar products except those requiring a Certificate of Necessity; industrial chemicals except those requiring a Certificate of Necessity; pigments, paints, and varnishes; toys, athletic and sporting goods.

Hercules Powder Co., Wilmington, Del., in conjunction with The Patent & Licensing Corp., subsidiary of The Flinckote Co., both of New York, has announced that plastic compositions to replace steel or other metals in many uses may now be manufactured by incorporating with various cellulosic fibers a resin powder known as Vinsol. Technical information may be secured from The Patent & Licensing Corp., 30 Rockefeller Plaza, which is holder of the patent.

The Rubber Reclaimers Association, Inc., 537 E. 88th St., New York, N. Y., held an election of officers at the annual meeting on January 12, at the Biltmore Hotel. The officers who will serve for the ensuing year comprise: John P. Coe (Nau-gatuck Chemical), president; Jean H. Nesbit (U. S. Rubber Reclaiming Co.), vice president; and Marion B. Miller, secretary-treasurer. A board of directors was also elected and consists of Allyn I. Brandt (Philadelphia Rubber Works), V. H. Dingmon (Xylos Rubber Co.), H. S. Royce (Boston Woven Hose & Rubber), F. E. Traflet (Pequanoc Rubber), and William Welch (Midwest Rubber Reclaiming Co.).

New Copolymer Corporation

Seven rubber companies comprise the ownership of the Copolymer Corporation which recently received a contract to operate a synthetic rubber plant which the Defense Plant Corporation is building for the government in Louisiana. The officers of the Copolymer Corporation are: President A. L. Freedlander, Dayton Rubber Mfg. Co., Dayton, O.; Vice President James A. Walsh, Armstrong Rubber Co., West Haven, Conn.; Vice President M. H. Clarke, Lake Shore Tire & Rubber Co., Des Moines, Iowa; Vice President George W. Stephens, Mansfield Tire & Rubber Co., Mansfield, O.; Vice President C. W. Helm, Gates Rubber Co., Denver, Colo.; Secretary F. M. Judson, Tire Division, Sears Roebuck & Co., Chicago, Illinois; Treasurer Howard W. Jordan, Pennsylvania Rubber Co., Jeannette, Pa.; D. M. Hulings, who has been appointed vice president and general manager of the new corporation, was formerly with the American Cyanamid Co. An experienced technical staff for the management of the new plant will be furnished by the rubber companies.

I. H. Albert, president of L. Albert & Son, dealer in rubber mill equipment, with plants at Trenton, N. J., Akron, O., Los Angeles, Calif., and Stoughton, Mass., has temporarily severed his connection with the firm to accept an appointment as an advisor in the Office of the Rubber Director, Washington, D. C. Mr. Albert was honored at a testimonial dinner on January 24 at the Y. M. Y. W. H. A. auditorium in Trenton, under the sponsorship of practically all Jewish organizations in Trenton, with many of which he has long been identified. Mr. Albert, who spends much time at the Los Angeles branch, has previously been given a farewell dinner there by California Jewry circles in appreciation of his cooperation in religious, cultural, and philanthropic institutions of that region.

Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa., according to Vice President E. T. Asplundh, has appointed W. I. Galliher executive sales manager of Columbia Chemical Division, manufacturer of heavy industrial chemicals. Mr. Galliher, formerly director of sales, succeeds Eli Winkler, who is retained in the capacity of executive consultant.

Pittsburgh Plate, in a year's review of its activities, by H. S. Wherrett, vice chairman of the board, reveals that in the first year of the war the company became a large supplier of paint, glass, and chemicals to the armed forces; expended considerable sums for increased facilities incidental to war demands; continued to maintain research work with a view to peace as well as war; and, at the same time, met without serious difficulty the restricted civilian demand for its goods. The products of the chemical division, soda ash, caustic soda, liquid chlorine, etc., supply basic raw materials to a variety of industries such as glass, soap, glass containers, textiles, rayon, reclaimed rubber, aluminum, and other non-ferrous metals; pulp and paper, chemicals and a host of others.

OHIO

General Organizes Network

General Tire & Rubber Co., Akron, has completed organization of the Yankee Network, Boston, Mass., following approval of the sale by the Federal Communications Commission. William O'Neil, president of General Tire, was named president and treasurer of the network; John Shepard, III, chairman of the board; H. Linn Travers, who with Mr. Shepard directed network policies for some years, executive vice president; R. T. Bartley, vice president; and R. F. Ide, assistant treasurer. Directors are Mr. O'Neil; L. A. McQueen and S. S. Poor, General vice presidents; James W. Haggerty, General Boston district manager; and Messrs. Shepard and Travers. The executive committee consists of Messrs. O'Neil, Shepard, and Haggerty. Mr. Shepard and Mr. Travers will manage the network, and the policies and personnel of the chain will be retained. The Yankee network consists of 21 stations, four of them owned outright and the other 17, affiliates.

New Guayule Mill Planned

Plans for the construction of a guayule mill in Mexico to provide 10,000 tons of rubber a year to the crude rubber stock pile were announced last month by The General Tire.

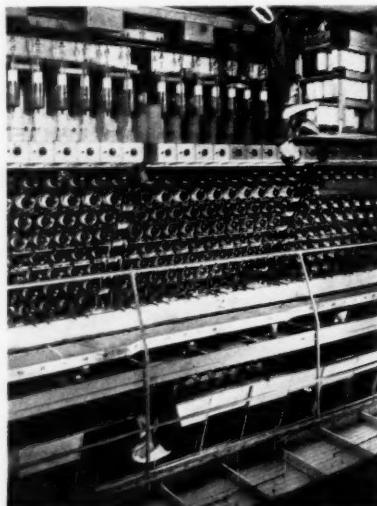
Agreements have been reached with the Mexican Government under which all the rubber will be shipped to the United States, and thousands of acres on which wild guayule shrub abounds have been leased from the Mexican landowners, according to Mr. O'Neil. Under this agreement the land will be resown in order that the land will not be despoiled of guayule shrub. Mr. O'Neil further said that a company has been formed in Mexico, with financial control held by Mexican interests. General Tire will manage the operation and invest in the enterprise.

Shore Addresses Business Men

T. Spencer Shore, General Tire vice president and treasurer, and for 17 months prior to December 15, 1942, director of the WPB Division of Industry Advisory Committees, addressed a luncheon of the National Federation of Sales Executives in New York, N. Y., January 12, on "Industry, People, and Government," in order to tell business men what he thought they should do to make sure that their firms will survive both the war and post-war era. Mr. Shore stressed four definite conclusions which he had reached as a result of his contacts in Washington with leaders in industry, with people in government, and with men in the labor movement and which, if they are adopted by business men, would do much toward insuring the continuation of the American way of life. First, men in industry must realize that the government is going to play a more and more important role in our national economy. Second, men in industry must understand government, and they must take an active interest in it.

This means supplying man-power for government jobs and giving our representatives in Congress the benefit of our constructive thinking, Mr. Shore said. It does not mean holding back and expecting the other fellow to do the job. Third, men in industry must realize that we are in a people's age, and property rights will be respected only if human rights are respected. In this connection it was said that the biggest competitive force in American industry in the near future is going to be human relations and that the man in charge of personnel in any manufacturing company should rank next to the president. Fourth, if the free enterprise system is to survive, the American people will have to want it badly enough to fight for it on the home front. Figures were given to show the large percentage of the total world production of metals, agricultural, and petroleum products found in the United States, the large percentage of railroads, automobiles, radios, and telephones in the United States, and the large percentage of rubber, coffee, and silk used in the United States, in order to drive home the point that these were accomplished by courage and capacity for hard work under the American way of life and that by serious thinking and active cooperation by men in industry, these accomplishments and the American way of life could be maintained and improved as well.

Industrial Rayon Corp., Cleveland, is replacing regular strength yarn production at its parent plant with high tenacity yarn for tire cord required for aircraft, motorized artillery, and army transport vehicles. The company has announced that its "revolutionary continuous process" will be used for making this tire yarn. The continuous machine, developed by Industrial Rayon, spins, washes, desulphurizes, bleaches, lubricates, dries, and twists the yarn without more than routine attention from the operators. Besides the machine can deliver sized or tinted yarn if desired.



Continuous Machine of Industrial Rayon Corp. for the Production of Tire Yarn

India Rubber World

Firestone Elections

Firestone Tire & Rubber Co., Akron, at its yearly stockholders' meeting January 9 reelected the board of directors: John W. Thomas, Harvey S. Firestone, Jr., Lee R. Jackson, John J. Shea, James E. Trainer, Stacy G. Carkhuff, Bernard M. Robinson, Harvey H. Hollinger, and Russell A. Leonard K., and Raymond C. Firestone. Then Chairman J. W. Thomas delivered his annual address on a review of the company's activities, especially those relating to the war effort.

At its meeting, following that of the stockholders, the board named Mr. Robinson, formerly general counsel and assistant secretary, secretary to succeed Mr. Carkhuff, who is retiring. The following company officers were reelected: Chairman Thomas; president, Harvey Firestone, Jr.; executive vice president, Mr. Jackson; vice president and treasurer, Mr. Shea; vice president in charge of production, Mr. Trainer; vice president in charge of sales, H. D. Tompkins; and comptroller, Mr. Hollinger.

Other Firestone News

The first butadiene made from grain alcohol for processing into synthetic rubber under the government program was received January 19 at the government synthetic rubber plant being operated by Firestone. The material was shipped by tank truck from West Virginia and is now being made into rubber.

Firestone engineers say that tire engineering research and development have advanced so rapidly that new improvements will be ready for use when wartime restrictions are lifted. Included is the general use of wide-base rims developed and tested at Firestone over a four-year period. Pending adoption by truck manufacturers, however, it is pointed out that owners may add thousands of extra miles to tires now in use by replacing the conventional-size rims with wide-base ones. The wide-base rim program started primarily to prolong tire life and increase stability of passenger-car operation. But when tested, wider rims scored 20-80% higher in tire mileage than the usual size, and car manufacturers adopted the wide-base principle extensively for 1942 models. Wide-base rims on trucks show practically the same results. The change-over is both practical and economical because the rims can be transferred from one vehicle to another which uses a smaller size of rim, and the cost of converting to wide-rim widths is more than offset by the increased tire mileage obtained.

Herron & Meyer, Akron, has announced that as of January 1, 1943, William A. Herron has been admitted as a general partner and that as of that date, the business in Akron and New York will be conducted under the name of Herron Bros. & Meyer. The new partner attended Lawrenceville Preparatory School, Princeton University (Class of 1908), and New York University. He was engaged in banking and paper mill management before joining Herron & Meyer in 1934, when he assumed charge of eastern sales.

The B. F. Goodrich Co., Akron, has made Edward M. Thorp manager of new products construction in the Mill 4 division. Mr. Thorp, a former night supervisor of Miller Rubber Co. before it became part of Goodrich, lately had been engaged in the production of war products.

K. D. Smith, in the rubber industry since 1915 and recently manager of Goodrich's Washington, D. C., office of the organization's national sales and service division, has transferred his headquarters to Detroit, Mich., where he will be principally concerned with problems relating to military tire equipment.

F. J. Rees, advertising and sales promotion manager of Goodrich's associated tires and accessories division, has been made sales manager of special accounts of the division, succeeding M. G. Huntington, now manager of the company's national sales and service division offices in Washington, D. C.

W. S. Richardson, general manager of the Goodrich industrial products division, revealed that government-financed synthetic rubber is being sold to rubber manufacturers to replace natural rubber in a number of articles. This rubber is being specified for various types of hose and other products which necessitate oil and gasoline resistance.

Harry A. Bauman, manager of the sundries department of the Goodrich industrial products division, retired December 31 after more than 42 years with the organization, all of which was spent in the rubber sundries field. Associates and friends tendered him a party in Akron on December 30.

J. J. Newman, Goodrich vice president, in an address January 8 before the New England Wartime Sales Management Conference in Boston, Mass., stated that completion of the nation's synthetic rubber program as scheduled, "probably in 1944, or within two years" will be an achievement far surpassing that of Germany, which has been working on the problem more than 30 years. After the war with the return of natural rubber added to the synthetic supply, the resultant rubber surplus will create "one of the biggest of all foreseeable post-war marketing problems." After the war, too, the country's whole concept of many raw materials and of quality in merchandise may change, according to Mr. Newman.

Mr. Newman in an address January 15 at Wichita, Kan., assured American farmers that they will be able to "keep their tractors rolling" through 1943 and probably for the duration—as far as tires are concerned. He explained how the nation's tractors could be kept "on rubber" by a "conversion" plan which utilizes thousands of tractor tires now in replacement inventory and even worn-out tires of varying sizes. He also stated that farm tractor tires of synthetic rubber are an accomplished fact, and as soon as synthetic rubber production reaches the point where military supplies are greater than minimum requirements, farm tractors will definitely begin to benefit from it. Comprehensive tests indicate that tractor tires of synthetic rubber will equal any of natural rubber for this purpose and that machines so shod will

do the work of two tractors using old-style steel wheels. Utilization of reclaimed and synthetic rubber is making possible the maintenance of milking and creamery equipment also, and on a "better than pre-war" basis despite reductions in crude rubber allocations.

John Westendorf, treasurer and general manager of Premier Rubber Mfg. Co., Dayton, has been elected a director of the Third National Bank & Trust Co., Dayton.

Goodyear Tire & Rubber Co., Akron, last month revealed that the company's Chemigum is now being used in the rotors within fuel lines of war planes to show each pilot how fast his fuel is being consumed and thus enables him to balance his rate of usage against his supply.

C. H. Brook has been elected comptroller of Goodyear Aircraft Corp. in addition to his duties as comptroller at Goodyear Tire.

H. L. Riddle, Jr., assistant treasurer of Aircraft, succeeds the late C. L. Weberg as assistant comptroller of Goodyear Tire.

R. E. Fulton, general auditor at Goodyear at Akron, has been made assistant comptroller at Aircraft. His successor at Akron is John F. Gleason, former district operating manager at Pittsburgh, Pa.

Goodyear is adapting flexible rubber aviation engine mounts to cushion the engines of Army training planes. Company engineers claim the mounts will lessen vibration, provide greater fire and bombing precision, and ease the nervous strain on pilots. The U. S. Army Air Corps is testing another cushioning method following the same principle, for engines of heavier military planes such as bombers.

Goodyear's Pliofilm is said to be saving thousands of man-hours in the handling and shipment of airplane engines. Pliofilm for plane engine coverings is said to save from 50 to 75 man-hours needed to grease and de-grease each engine. Elimination of the heavy grease method does away with the danger of corrosion, of plugging vital ports, and the necessity of partial disassembling. At the engine factory a rolled-up transparent Pliofilm bag is placed in the bottom of each engine's packing case. The engine is then loaded into the case, and the bag pulled up around it and hermetically sealed, until the engine is installed in the plane. Before sealing, however, air is drawn out of the bag by suction, and a one-pound sack of silica derivative is attached to each cylinder to absorb all the remaining moisture. Though each bag contains about 65% natural rubber, 90% of it is reclaimed after the bags are stripped from engines and made into new bags.

NEW ENGLAND

Firestone Fire Rubber Salvaged

Because American business men would not concede that great stores of rubber damaged in the October 12, 1941, fire at the Fall River, Mass., plant of the Firestone Rubber & Latex Products Co. were

a total loss, much of that rubber is now on the treads of tanks in North Africa and in the tires of planes battling the Axis on many fronts. The conflagration destroyed 30 buildings containing 18,000 tons of crude rubber, and it was estimated at that time that between 5 and 10% of the nation's crude rubber supply had been destroyed. Despite the hopeless outlook the Rubber Reserve Co., Firestone, and the fire insurance companies agreed to try to salvage any undamaged rubber remaining.

Operations were begun less than two weeks after the fire. First the wrecked buildings were torn down, and rubbish removed, to the extent of 500 truckloads, before anything could be done about the rubber. The method finally developed for digging out the rubber was similar to "strip" mining. Seven great shovels, a crane, and a dozen big trucks were used, to scoop up the rubber, which had embedded in it debris that had sunk in when heat softened the rubber. The debris had to be extracted to conserve shipping space and weight; so the rubber was steam "laundered." A boiler large enough to supply steam to six nozzles was set up with a pit dug beneath each nozzle. Each pit was covered with a roller conveyor to handle the rubber chunks and to catch the dirt and such as it was blown off the rubber blocks by the live steam at 200 pounds' pressure.

This operation was carried out through last winter, spring, and summer, and late into September, 1942, with 65 men operating the "laundry" in three shifts. After cleaning, the rubber was sprinkled with soapstone to prevent adherence of chunks and then shipped to three of the leading rubber manufacturers for conversion into tires, tank treads, and numerous other military articles.

Godfrey L. Cabot, Inc., Boston, Mass., through a subsidiary, has made application to the Louisiana Department of Conservation to build in Evangeline Parish a large furnace-type carbon black plant for additional production of Sterling brand semi-reinforcing black. The plant will use waste-residual gas from an adjacent gasoline plant and will be similar to the plant which Cabot now has under construction at Guymon, Okla. Both projects have been granted high priorities by the W.P.B.

New England during the first 11 months of 1942 experienced industrial activity about 15% higher than for the like period of 1941. The greatest gains were in rubber footwear, rubber goods, electrical machinery, foundry and machine shop products, and the metal industries.

Rhode Island rubber manufacturers reported for December 1.1% increase in man-hours worked over the previous month. Six firms showed 211,718 man hours worked, 0.7% above the November figure and 3.9% higher than in December, 1941. Earnings last December were 3.9% greater than in November and 13.6% above December, 1941, figures. The average weekly wage reported by eight rubber concerns for December, 1942, was \$31.75.

CANADA

Synthetic Rubber Schedule

Polymer Corp., Ltd., government owned company, with headquarters at Toronto, Ont., has been working for several months constructing a plant to make synthetic rubber. This plant will cost about \$40,000,000 and have an eventual annual capacity, to be reached in 1944, of 41,000 long tons. Hon. C. D. Howe, Minister of Munitions and Supply, Ottawa, Ont., expects the plant to be in production next September and maintains that it will continue as an important post-war industry, making Canada independent of foreign sources of rubber.

Two types of synthetic rubber are to be made in Canada: 34,000 tons a year of Buna S and 7,000 tons of Butyl. Chief raw materials are to be derived from petroleum, although about 6,000 tons of the Buna S rubber is to be made from alcohol; which will come from existing distilleries and will use grain as its prime raw material.

Three other companies have been organized to handle various stages of process. Imperial Oil, Ltd., has incorporated a wholly owned subsidiary, St. Clair Processing Corp., which will operate the butadiene and Butyl rubber plant at Sarnia, Ont., which Polymer Corp. is building. The styrene plant will be operated by the Dow Chemical Co. Canadian Synthetic Rubber Co., jointly owned by Dominion Rubber Co., Ltd., Goodyear Tire & Rubber Co., Ltd., Firestone Tire & Rubber Co., Ltd., and B. F. Goodrich Rubber Co. of Canada, Ltd., will operate the polymerization plant in connection with the synthetic rubber operation.

The combined synthetic rubber product program of the United States and Canada provides for 300,000 to 400,000 tons in 1943 and a 1,000,000-ton output for 1944. E. R. Rowzee, factory manager of Canadian Synthetic Rubber, told a meeting of the Ontario Section of the American Society of Mechanical Engineers at Toronto, Ont., January 14. He added there is not much chance that civilians will get synthetic rubber tires even in the peak-production year, 1944.

"The stockpile of natural rubber is rapidly going down, and many authorities believe it will be gone before the end of the year," he said. "Unless the synthetic rubber industry is greatly developed we will be in a serious condition."

Department of Munitions & Supply, Ottawa, Ont., on January 7 set up a rubber conservation and technical committee, which will cooperate with Rubber Controller Alan H. Williamson in the use and substitution of synthetic rubber and rubber substitutes for crude rubber. It is an industry committee and is divided into several subcommittees covering the various products manufactured from rubber. The committee follows: W. R. Walton, Jr., chairman, C. L. Brittain, J. A. Wilson, E. S. Young, John Ramsey, M. N. Cryder,

W. H. Shaw, W. H. Eastlake, C. C. Thackray, H. Wolfhard, F. M. Cressman, H. T. Humby, C. Catran, N. A. Austin, O. W. Titus, and E. D. Jackson.

The Department on January 13 announced that six-ply tires may now be sold only for eligible heavy-duty trucks.

Manufacture of tube valve stems has been placed on a 70% quota, and Mr. Williamson has suggested that dealers remove serviceable stems from worn-out tubes to replace damaged stems on good tubes. Such action will not be considered violation of the regulation prohibiting cutting or destroying a tube as long as the rubber portion of the worn-out tube is quickly disposed of through recognized scrap channels, according to the Rubber Controller.

The Munitions Department on January 22 announced that beginning in February a limited number of reclaimed rubber tires will be rationed to a selected list of motor vehicles. The "ordinary motorist", however, "will have to wait until the war is over before any type of rubber" will be available to make his tires.

P. Horace Boivin, president of Granby Elastic Web Co., Ltd., Granby, P. Q., for the third time has been elected mayor of Granby.

Dominion Rubber Co., Ltd., Montreal, P. Q., has appointed F. W. McMaster director of the new central engineering department. Mr. McMaster has been with the company 12 years in industrial engineering and manufacturing units.

W. Jones, of the Dominion company, has been named to the executive committee district representatives, Montreal, of the Shoe Manufacturers Association.

Gutta Percha & Rubber, Ltd., Toronto, Ont., has appointed A. Gordon manager of its Pacific division, succeeding F. Scott, who recently retired after 44 years with the company, 38 of which were spent at the Vancouver, B. C. branch. Members of that branch honored Mr. Scott at a banquet on the eve of his retirement.

C. Mather, of the Gutta Percha company, is a member of the executive committee for the province of Ontario of the Shoe Manufacturers Association.

R. C. Berkinshaw, general manager and treasurer of Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., has been elected a director of The Mutual Life Assurance Co. of Canada, Waterloo, Ont.

Apparatus for Rubber Analysis

(Continued from page 485)

rubber including reclaim, and balata. None of the common rubber compounding ingredients interfere markedly, but hard natural rubber and the common types of synthetic rubbers cannot be analyzed by this method with any degree of accuracy. The apparatus as illustrated and detailed information on the method may be obtained from Macalaster Bicknell Co.

OBITUARY

C. Edward Murray

CHARLES EDWARD MURRAY, president of the Crescent Insulated Wire & Cable Co., Trenton, N. J., died January 12 at his home in Trenton after a prolonged illness.

General Murray was born in Lambertville, N. J., in 1863. Upon graduation from business college, he joined his father in the rubber reclaiming firm of Murray, Whitehead & Murray. Nine years later he had full charge of the concern, which was succeeded by the Assanpink Rubber Co. in 1893 with him as treasurer. Soon after, the deceased organized the Crescent Belting & Packing Co. and the Crescent Insulated Wire & Cable Co., of which he was president until the time of his death. In 1902 he established the Empire Rubber Co. and four years later the Empire Tire Co. These two firms incorporated in 1913, and the Murray Rubber Co. resulted as an outgrowth of that union in 1922. He was also general manager of the Lambertville Rubber Co. from 1919-1924.

At one time, General Murray was a Republican leader in Trenton. He was named city clerk in 1894, a position he held for ten years. His military career began with the 7th Regiment, New Jersey National Guard in 1885. From 1895 to 1899 he served as paymaster for the regiment, retiring after that with the rank of captain. Governor Edward C. Stokes appointed General Murray quartermaster general in 1905, and he served in that capacity until his retirement in 1934. He was also recipient of the state's Distinguished Service Medal in recognition of his achievements.

His wife, two sons, and a daughter survive.

Arthur Thomas Hopkins

A HEART attack caused the death of Arthur T. Hopkins, December 19, 1942. Mr. Hopkins was born in 1869 and graduated from Massachusetts Institute of Technology, 1897, where he majored in sanitary engineering. He was connected in various capacities with the rubber industry. He had been superintendent of the Boston Woven Hose Co., Boston, Mass., manager of the Mechanical Rubber Co., subsidiary of United States Rubber Co., Cleveland, O., and manager of the United States Rubber Co. footwear plants with headquarters in New Haven. In his association with the rubber field he had trained several men who have since held positions of considerable authority.

Mr. Hopkins was a member of the American Society of Mechanical Engineers, Sons of the Revolution, and a former member of the Engineers Clubs of New York and Boston.

Funeral services were held December 21, 1942, in Wellfleet, Mass., and interment followed in Pleasant Hill Cemetery, Wellfleet.

Surviving Mr. Hopkins are two daughters, two sisters and a brother.

George A. Williams

GEORGE ALVIN WILLIAMS, first vice president in charge of sales of United Carbon Co., Inc., Charleston, W. Va., and a well-known figure in the industry for many years, died at his home in Clarksburg, W. Va., January 4, after an illness of several years. Mr. Williams was one of the organizers of United Carbon, formed in 1925 by the merger of the Liberty Carbon Co. of Kentucky, the Louisiana Carbon Co., and the Kidas Carbon Co. of West Virginia.

Born in Weston, W. Va. in 1890, Mr. Williams completed a course at Eastman Business College at Poughkeepsie, N. Y., in 1909 and until 1915 was a salesman for the Yale & Towne Mfg. Co., Stamford, Conn. Preceding his activity in the carbon black business, in 1915 and subsequent years of the first World War, he was manager of the Fuel City Mfg. Co., Clarksburg. During the period between 1915 and 1925, he was an official of the Liberty Carbon Co., president of the Clarksburg Ice & Storage Co., Clarksburg, and the Butler Ice Co., Butler, Pa., and vice president of the Consolidated Supply Co., Clarksburg.

Mr. Williams was a member of the Masons and was a past exalted ruler of B. P. O. Elks No. 482.

He is survived by his wife, two daughters, a son, and a brother.

W. H. McLean

WILLIAM HECTOR McLEAN, 58, for the last six months a member of the tire rationing division of the Wartime Prices & Trade Board, passed away December 28 following a brief illness. Born in Paris, Ont., Canada, he received his education at local schools.

For 18 years Mr. McLean was on the staff of the B. F. Goodrich Rubber Co. of Canada, Ltd., Toronto, for some time as district manager. He resigned to become associated with the Dominion Rubber System, at Windsor, Ont., where he remained for three years before returning to Goodrich. Surviving are his wife and two sons.

The funeral was held from the deceased's home, and interment followed in St. John's (Norway) Cemetery, Toronto.

Howard R. Burkle

AFTER several weeks' illness, Howard Russell Burkle, 45, district manager for the Goodyear Tire & Rubber Co. at Columbus, O., since 1941, died there January 5. With Goodyear since 1920, when he was employed in the Akron factory, Mr. Burkle had served as salesman in Omaha, Neb., adjuster in Milwaukee, Wis., and Memphis, Tenn., and salesman in Little Rock, Ark., and Louisville, Ky. He was promoted to district manager at Albany, N. Y., in 1932 and made head of the Baltimore sales district in January, 1935.

An alumnus of Mt. Union College, Mr. Burkle was a member of Sigma Nu fraternity.

Funeral services were held in Monticello, Ark.

His wife and two children survive him.

Edgar Palmer

AFTER a brief illness, Edgar Palmer, 62, president and chairman of the board of New Jersey Zinc Co., New York, N. Y., passed away at his home in Princeton, N. J., January 8, 1943.

Born in New York November 12, 1880, Mr. Palmer attended Princeton University where, besides his Bachelor of Arts, he received a degree as Electrical Engineer. His career began in 1905 when Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., added him to its staff as an engineering assistant. A year later he switched to the Empire Zinc Co., Canyon City, Colo., as electrical engineer. Upon returning east in 1909, Mr. Palmer became assistant to the general manager of New Jersey Zinc. Within six months he rose to assistant to the president and the next year he served for a time as acting president. The deceased was vice president until 1912, at which time he was made president, remaining in that capacity until the time of his death. Mr. Palmer also held the chairmanship to several other concerns including the New Jersey Zinc Sales Co.

Funeral services were held January 10, 1943, in the Princeton University Chapel followed by burial in Princeton Cemetery.

Surviving Mr. Palmer are his wife and daughter.

Joel P. McIntire

PNEUMONIA caused the death, on December 29, of Joel P. McIntire, former superintendent of Plant 2 of The Goodyear Tire & Rubber Co., Akron, O., at his home in Los Angeles, Calif., where he had been living while on leave of absence because of ill health. Mr. McIntire joined the company on January 7, 1913, as a supervisor, became a foreman in 1914, was sent later to the California plant as a division superintendent, and returned to Akron in the same capacity in 1934.

The deceased was born in Mt. Hope, O., January 1, 1890. He was graduated from the Wooster, O., High School in 1908. While at Goodyear, he belonged to all the company clubs and was also a 32nd degree Mason.

Funeral services and interment took place January 2 at Inglewood, Calif.

Mrs. McIntire and their daughter survive.

A. J. Fleiter

FOLLOWING a lengthy illness, Andrew J. Fleiter, 60, president, treasurer, and general manager of The Akron Standard Mold Co., Akron, O., which he founded in 1918, died December 29 at his home in Akron. Mr. Fleiter was also president and treasurer of the Electromelt Steel Casting Co., which he organized in 1938, and vice president and general manager of Barberon Foundry Co.

The deceased at one time had been a professional football player. He also belonged to the Akron City Club.

Funeral services were held January 2 at St. Sebastian's Church, with burial in Holy Cross Cemetery.

Fredrick D. Chester

FREDERICK DIXON CHESTER, chief chemist of Mimex Co., Inc., Long Island City, N. Y., died at his home in the Bronx, N. Y., January 1, after a short illness. He was born in Santa Domingo, Haiti, October 8, 1861, and studied at Washington and Cornell universities, receiving a B. S. and an M. S. in 1882 and 1885, respectively. The deceased also held an honorary doctor's degree from the University of Delaware. Until he joined Mimex in 1922, the deceased was engaged in research on mining, botany, biology, and bacteriology. At the Mimex company he worked on rubber technology including synthetic resins, cements, and adhesives.

Mr. Chester belonged to the American Chemical Society, American Society for Testing Materials, Franklin Institute, and many other scientific groups. He was also the author of "Manual of Determinative Bacteriology."

Solemn requiem mass at St. Philip Neri Church, Bronx, January 4, preceded interment.

Mr. Chester leaves a wife.

FINANCIAL

Firestone Tire & Rubber Co., Akron, O., and subsidiaries. Year ended October 31, 1942: net profit, \$12,481,129, equal, after preferred dividends, to \$5.04 each on 1,930,811 common shares outstanding, contrasted with \$11,262,427, or \$4.37 a common share, in the preceding fiscal year; depreciation, \$10,307,082, against \$8,711,393, taxes, \$33,620,874, against \$31,136,192; net sales, \$352,693,500 (a record high), against \$268,091,826; total investment in foreign countries, after charging \$1,072,828 to contingency reserve to cover loss of investment in enemy-occupied territory, \$31,901,215; current assets, October 31, 1942, including \$13,185,423 cash and \$857,25,659 inventories, \$146,601,536, current liabilities, \$54,408,643, compared with current assets of \$134,837,138, including \$13,399,637 cash and \$74,264,310 inventories, and current liabilities of \$45,520,283 the year before.

Lee Rubber & Tire Corp., Conshohocken, Pa., and subsidiary. Year ended October 31, 1942: net profit, \$1,144,765, equal to \$4.74 each on 300,000 capital shares, against \$1,482,954, or \$6.14 a share, in the previous fiscal year; taxes, \$1,031,059, against \$528,599.

Midwest Rubber Reclaiming Co., East St. Louis, Ill. Year ended October 31, 1942: net income, \$450,545, equal to \$3.41 each on 125,000 common shares, against \$582,800, or \$4.47 a share, in the preceding 12 months.

O'Sullivan Rubber Co., Inc., Winchester, Va. Nine months to September 30: income before income taxes, \$290,007, against \$113,008 on same basis for the 1941 period; net sales, \$2,124,353, against \$1,931,729.

CALENDAR

- Feb. 5. New York Section, A. C. S., Hotel Pennsylvania, New York, N. Y.
- Feb. 12. Chicago Rubber Group.
- Feb. 12. Rubber & Plastics Division, Montreal Section, S. C. I., McGill University.
- Feb. 18. Buffalo Group and Western New York Section, A. C. S., Niagara Falls, N. Y.
- Feb. 19. American Section, S. C. I.—American Institute of Chemical Engineers, Commodore Hotel, New York, N. Y.
- Mar. 5. S. C. I.—A. C. S. William H. Nichols Medal Award.
- Mar. 12. Rubber & Plastics Division, Montreal Section, S. C. I., Miner Rubber Co., Granby, P. Q., Canada.
- Mar. 16-17. National Association of Waste Material Dealers, Inc. Annual Conference, Hotel Sherman, Chicago, Ill.
- Mar. 19. New York Rubber Group, Building Trade Employers Assn. Clubrooms, 2 Park Ave., New York.
- Apr. 9. Rubber & Plastics Division, Montreal Section, S. C. I., McGill University.
- Apr. 15-16. Rubber Division, A. C. S. Spring Meeting, Book-Cadillac Hotel, Detroit, Mich.
- Apr. 30. Buffalo Rubber Group and Canadian Chemical Association, International Meeting, Niagara Falls, Ont., Canada.

Norwalk Tire & Rubber Co., Norwalk, Conn. Year ended September 30, 1942: net profit, after \$50,000 post-war contingencies, \$142,350, equal to 55¢ a common share, against \$89,071, or 29¢ a share, in the preceding 12 months; tax provision, \$288,000, against \$36,000.

Seiberling Rubber Co., Akron, O. Year ended October 31, 1942: net income, after \$408,759 provision for taxes, less \$15,000 post-war credit, \$732,928, against \$813,918 for the preceding fiscal year; net sales, \$11,681,388, against \$13,693,953; current assets, \$4,632,092; current liabilities, \$768,877.

MIDWEST

Monsanto Chemical Co., St. Louis, Mo., has promoted Nicholas X. T. Samaras and Roy W. Sudhoff to assistant directors of the central research department. Dr. Samaras joined Thomas & Hochwalt Laboratories, Inc., Dayton, O., in 1934, which Monsanto absorbed two years later. His special fields of investigation have been theories of solutions, reaction rates, surface active agents, plastics, and catalysis. Mr. Sudhoff joined Monsanto in 1928 in the

Dividends Declared

COMPANY	STOCK	RATE	PAYABLE	STOCK OF RECORD
Baldwin Rubber Co.	Com.	\$0.12½	Jan. 21	Jan. 15
Boston Woven Hose & Rubber Co.	Com.	0.50	Feb. 25	Feb. 15
Crown Cork & Seal Co., Ltd.	Com.	0.50 q.	Feb. 15	Jan. 30
Detroit Gasket & Mfg. Co.	Pfd.	0.30 q.	Mar. 1	Feb. 15
DeVilbiss Co.	Com.	0.50	Jan. 15	Dec. 28
DeVilbiss Co.	6½% Pfd.	0.37½ q.	Jan. 15	Dec. 28
Firestone Tire & Rubber Co.	Pfd.	1.50 q.	Mar. 1	Feb. 15
General Cable Corp.	7½% Pfd.	1.75 accum.	Feb. 1	Jan. 25
Goodyear Tire & Rubber Co.	\$5 Cum. Conv. Pfd.	1.25 q.	Mar. 15	Feb. 15
Goodyear Tire & Rubber Co.	Com.	0.50 irreg.	Mar. 15	Feb. 15
Hercules Powder Co.	Pfd.	1.50 q.	Feb. 15	Feb. 4
Norwalk Tire & Rubber Co.	Pfd.	0.87½ q.	Apr. 1	Mar. 18
Okonite Co.	Com.	0.50 extra	Feb. 1	Jan. 15
Okonite Co.	Com.	1.50 q.	Feb. 1	Jan. 15
Philadelphia Insulated Wire Co.	6½% Pfd.	1.50 q.	Feb. 15	Feb. 1
Tyler Rubber Co.	6½% Pfd.	1.50 q.	Feb. 15	Feb. 5

engineering department and in 1939 became resident engineer and group leader at the central research department in Dayton.

Reichhold Chemicals, Inc., Detroit, Mich., has opened new offices at 30 Rockefeller Plaza, New York, N. Y. The sales and purchasing departments for the Elizabeth, N. J., plant and the eastern section of the country, and the company's export department are located there. E. A. Terray is managing the New York office. Other recent expansions of Reichhold include the opening of a new resin making plant in California and the construction of a chemicals producing unit in Alabama.

Thomas Midgley, Jr., vice president of Ethyl Corp., Detroit, Mich., and widely known for his researches on rubber and gasoline, was elected president of the American Chemical Society to assume office January 1, 1944.

Specific Heat of Hycar OR¹

MEASUREMENTS of specific heat were made on a sample of Hycar OR synthetic rubber from 15° to 340° K. by means of an adiabatic vacuum-type calorimeter. The experimental values of the specific heat between 15° and 22° K. were well represented by the Debye specific-heat equation, using a β_2 value of 80, and accordingly the values below 15° K. were calculated with this equation. At about 250° K. the material has a transition of the second order; the specific heat increases by about 40% to a value of 1.84 Int. joules·gram⁻¹·degree⁻¹ just above the transition. From 250° to 340° K. the specific heat-temperature curve is nearly linear, and the values can be calculated to within 0.2% from the formula $C_p = 0.00283T + 1.120$, in Int. joules·gram⁻¹·degree⁻¹. At 298.16° K. (25°C) the specific heat is 1.971 Int. joules·gram⁻¹·degree⁻¹ (0.4712 calories·gram⁻¹·degree⁻¹). The increase in entropy resulting from heating from 0° to 298.16° K. was calculated to be 1.743 ± 0.002 Int. joules·gram⁻¹·degree⁻¹ (0.4167 ± 0.0005 calories·gram⁻¹·degree⁻¹).

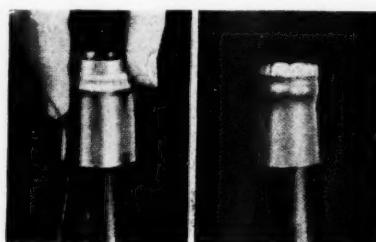
¹Abstract of Research Paper RP1487 (National Bureau of Standards, Washington, D. C.), "Specific Heat of the Synthetic Rubber Hycar OR from 15° to 340° K." by Norman Bekkedahl and Russell B. Scott.

"Cel-O-Seal" Cellulose Closures

NOW being marketed are cellulose bottle hoods that will fit over a wide variety of glass bottle necks for an assortment of products as food, drugs, cosmetics, wines, and toothbrushes. These "Cel-O-Seal" bands are made from wood pulp by a method similar to that employed in making cellophane and viscose process rayon and are said to hold firmly the closure—cap, lid, or cork—to the bottle, preventing any loosening that would let air in and flavor or aroma out. These bands also keep bottle mouths free of dirt accumulations that otherwise might occur in transit from factory to store. Necessary printing can also be put on the bands.

A war use of these cellulose products bands is by airplane manufacturers who utilize the material to protect the open ends of fuel and hydraulic lines and other pipes and tubes during assembly and shipping. The tubes thus are said to be closed against dust and dirt and protected from rust. If an opening sealed with a cellulose hood is reopened, the broken seal is evidence of tampering; so possible sabotage can be eliminated. These hoods replace plugs of such critical materials as cork, rubber, and metal formerly used in airplane assembly work. They are bright red, easily seen, and eliminate any danger that they will be left in place during final assembly.

As in the case of bottle seals, the caps are delivered to the user in a container of liquid that is non-corrosive and non-toxic. The wet cap is placed over the tube or bottle end, and it dries in a few minutes, shrinking tightly. Because of this property the wet hoods can be used in large enough sizes to slip easily over the pipe end and even over an irregular object. Twenty or 25 may be applied a minute by hand without any machinery. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.



Quick-Sealing Bottle Hood

GR-S Tires

MEMORANDUM
TO: Consumers of Synthetic Rubber
 (GR-S)
FROM: H. E. Simmons,
 Office of the Rubber Director
SUBJECT: GR-S Tires

We are attaching, purely for your information a release entitled "GR-S Tires, Standard Methods of Compound Evaluation and for Reporting Test Data," dated January 4, 1943.

It is our opinion that a description of the best practices in pneumatic tire compounding and testing may be helpful to you, not only as general information, but also in evaluating new variables such as new compounding materials, or revised mixing or curing methods.

GR-S Tires—Standard Methods of Compound Evaluation and for Reporting Test Data

In order that the Office of the Rubber Director may more conveniently and accurately correlate and evaluate test data as received from manufacturers or testing laboratories it is requested that all test reports be submitted in the manner set forth herewith.

Laboratory Tests

I. Laboratory Press Cures

All laboratory test data will be reported on the basis of cures made at or calculated to 280° F. Where it is not convenient or desirable for a laboratory to cure at this temperature, then the equivalent time at 280° F. will be determined by means of the following table which has been calculated from the formula:

$$\frac{t_1}{t_2} = K \frac{T_2 - T_1}{10}$$

where t_1 and t_2 are the times, and T_1 and T_2 are the temperatures. $K = 1.43$ where temperatures are in degrees Fahrenheit.

TABLE FOR CALCULATING CURING TIMES IN TERMS OF 280° F.

Temp.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
240° F.	.24	.25	.26	.27	.28	.29	.30	.31	.32	.33
250	.34	.35	.37	.38	.39	.41	.42	.44	.46	.47
260	.49	.51	.53	.54	.56	.59	.61	.63	.65	.68
270	.70	.73	.75	.78	.81	.84	.87	.90	.93	.97
280	1.00	1.04	1.07	1.11	1.15	1.20	1.24	1.28	1.33	1.38
290	1.43	1.48	1.54	1.59	1.65	1.71	1.77	1.84	1.90	1.97
300	2.05	2.12	2.20	2.28	2.36	2.45	2.54	2.63	2.72	2.82
310	2.92	3.03	3.14	3.25	3.37	3.49	3.62	3.75	3.89	4.03
320	4.18	4.33	4.49	4.65	4.82	5.00	5.18	5.37	5.57	5.77

EXAMPLE No. 1

It is desired to convert 60 minutes at 292° F. to the equivalent time at 280° F. Answer: $60 \times 1.54 = 92$ minutes.

EXAMPLE No. 2

It is desired to convert 90 minutes at 274° F. to the equivalent time at 280° F. Answer: $90 \times 0.81 = 73$ minutes.

In tabulating physical test data the cures will be listed as though made at 280° F., with the actual curing times and temperature shown parenthetically so that the record may be completely accurate.

Due to the wide range in curing rates of various GR-S compounds no arbitrary curing times are specified, but it is requested that each laboratory report data at optimum cure and in addition at least one overcure and one undercure.

II. Physical Tests

A. TENSILE TESTS. Load in pounds per square inch at 300% elongation, ultimate tensile strength, and percentage ultimate elongation will be reported together with comparative data obtained on the same cures made on the standard test formula given on page 111-2 of the WPB general release dated September 1, 1942. For convenience this formula is repeated here:

WPB STANDARD TEST FORMULA	
GR-S.....	100
Bardol.....	5
Zinc Oxide.....	5
Channel Black (Easy Processing).....	50
Sulphur.....	2
Mercaptobenzothiazole.....	1.5
	163.5

The standard compound should be mixed in the same manner and from the same lot of GR-S and preferably cured at the same time as the experimental compound.

B. MECHANICAL EFFICIENCY, RESILIENCE, AND RELATED PROPERTIES. The method used must depend upon laboratory equipment available. Reports must have complete identification of equipment used and conditions of operation. To simplify interpretation of results, figures should be reported in terms of percentage of the control, which again should be the WPB standard test formula given above. Thus if a resilience figure is obtained as in rebound, this percentage will be the ratio of the experimental resilience over the control resilience multiplied by 100.

EXAMPLE NO. 1	
Experimental resilience.....	= 60%
Standard resilience.....	= 40%
Final % reported.....	= 60
	X 100 = 150%
	40

Where the torsional pendulum test is used, the final percentage will be the inverse ratio of the hysteresis losses (logarithmic decrements) multiplied by 100.

EXAMPLE NO. 2	
Experimental hysteresis.....	= 0.200
Standard hysteresis.....	= 0.300
Final % reported.....	= .300
	X 100 = 150%
	.200

Where heat build-up measurements are made, the reported figure will be the inverse ratio of the temperature rises multiplied by 100.

EXAMPLE NO. 3	
Experimental temp. rise.....	= 100° F.
Standard temp. rise.....	= 150° F.
Final % reported.....	= 150
	X 100 = 150%
	100

C. RESISTANCE TO CUT GROWTH. The laboratories will continue to use available equipment (if any), and will make clear-cut identification of the equipment used, and the nature of the cuts made in the surface of the stocks at the grooves. Here again results will be reported in terms of % of the WPB standard compound.

D. TEAR RESISTANCE. Each laboratory will continue to use the tear test which it has been using, whether hand or machine tear, being careful to make clear the method and conditions used, and to report in terms of the WPB standard compound.

E. SHORE HARDNESS. The Shore gage should be kept in repair and calibrated regularly, and hardness figures reported in comparison with the WPB standard. Readings are taken after 30 seconds in order to reach equilibrium.

III. Laboratory Evaluation of Tread Stocks

There is at present general agreement

in the tire industry that the following properties are the most important for correlation with actual tire service.

A. ELONGATION. Good elongation at overcure and/or high temperature and/or after approximately 24 hours in the oven at 100° C. is the most important characteristic for GR-S tread compounds.

B. MECHANICAL EFFICIENCY, RESILIENCE, AND RELATED PROPERTIES. This is the second most important property that can be given sound numerical evaluation.

C. SHORE HARDNESS. This property and those that follow are secondary to the two properties just listed, and it is not possible at present to distinguish between them with respect to importance. There is probably an optimum tread hardness for each type of tire service. Range at room temperature is between 50 and 70, and stocks should show a minimum change in hardness as measured by hot vs. room temperature determinations.

D. MODULUS. There is probably an optimum modulus for each type of tire service. No range can yet be recommended, but such data should be kept in mind for future correlation with service results.

E. TEAR RESISTANCE.

F. TENSILE STRENGTH.

The following laboratory tests may also be of interest for tread stocks, and may or may not be reported upon at the discretion of each individual laboratory.

G. CUT GROWTH RESISTANCE.

H. ABRASION RESISTANCE.

IV. Laboratory Evaluation of Carcass Stocks

For carcass stocks laboratory tests are rated in the following order of importance:

A. MECHANICAL EFFICIENCY, RESILIENCE AND RELATED PROPERTIES.

B. ELONGATION. Good elongation at overcure and/or at high temperatures and/or after approximately 24 hours in the oven at 100° C.

C. MODULUS.

D. SHORE HARDNESS.

E. TEAR RESISTANCE.

F. TENSILE STRENGTH.

A test for flexing life may also be of interest for carcass stocks, and may or may not be reported upon at the discretion of each individual laboratory.

V. Carcass Rupture Resistance Tests

In view of the fact that a good percentage of tire failures in Army service are impact breaks of various types, it is important that some evaluation of total carcass strength be made. Bureau of Standards penetration test, guillotine test, or any similar method may be used, results being compared with same size rubber tire.

VI. Indoor Wheel Tests

It has been found as the result of a careful survey that it is impractical to set up a standardized test wheel procedure. Furthermore it has been generally agreed that such a standardization would not be desirable, as maximum flexibility of test conditions is required in order to produce the various desired types of failure. Also severity of tests must be constantly adjusted in order to test properly the quality of the tires as they are improved.

Therefore it is suggested that each laboratory continue to operate its indoor wheels in accordance with its previously adopted standards; in each case, however, reporting results in terms of a control tire, preferably a rubber tire of WPB standard construction. In each case the conditions of test must be completely described. In dealing with failures the following stand-

ardized nomenclature will be used:

A. HEAT BREAK.

1. Blow-out at crown.

2. Blow-out at shoulder region.

B. FLEXING BREAK. (Breakdown of cord plies in shoulder region.)

C. TREAD SEPARATION.

1. Induced by cushion and/or breaker fatigue.

2. Induced by tread cracks.

D. PLY SEPARATION. (Indicate which plies and location—crown, shoulder, sidewall, etc.)

It is requested that details on the results of analysis and tests on the failed tires be included in the wheel test reports. Furthermore it is requested that detailed measure-

ment data including tire growth be given. Both mold and inflated tire measurements are desired, as follows:

1. Outside diameter.
2. Cross section.
3. Curing ring width and measuring rim.
4. Tread width (arc).
5. Tread radius.
6. Tread design depth (center).

VII. Road Tests

The same general comments apply as for indoor wheel tests. It is suggested, however, that in all road tests, rotation of tires be from right rear to left rear and vice versa, with the same for the front positions, rather than rotation completely

around the car. It is agreed that this method results in a more severe and more rapid test for the rear tires. Here again comparisons with WPB standard construction rubber tires must be included.

The same standardized nomenclature will be used in dealing with failures as that shown above for indoor wheel tests, with the following additions:

E. BRUISE BREAK.

F. PUNCTURED AND RUN FLAT.

G. BEAD FAILURE.

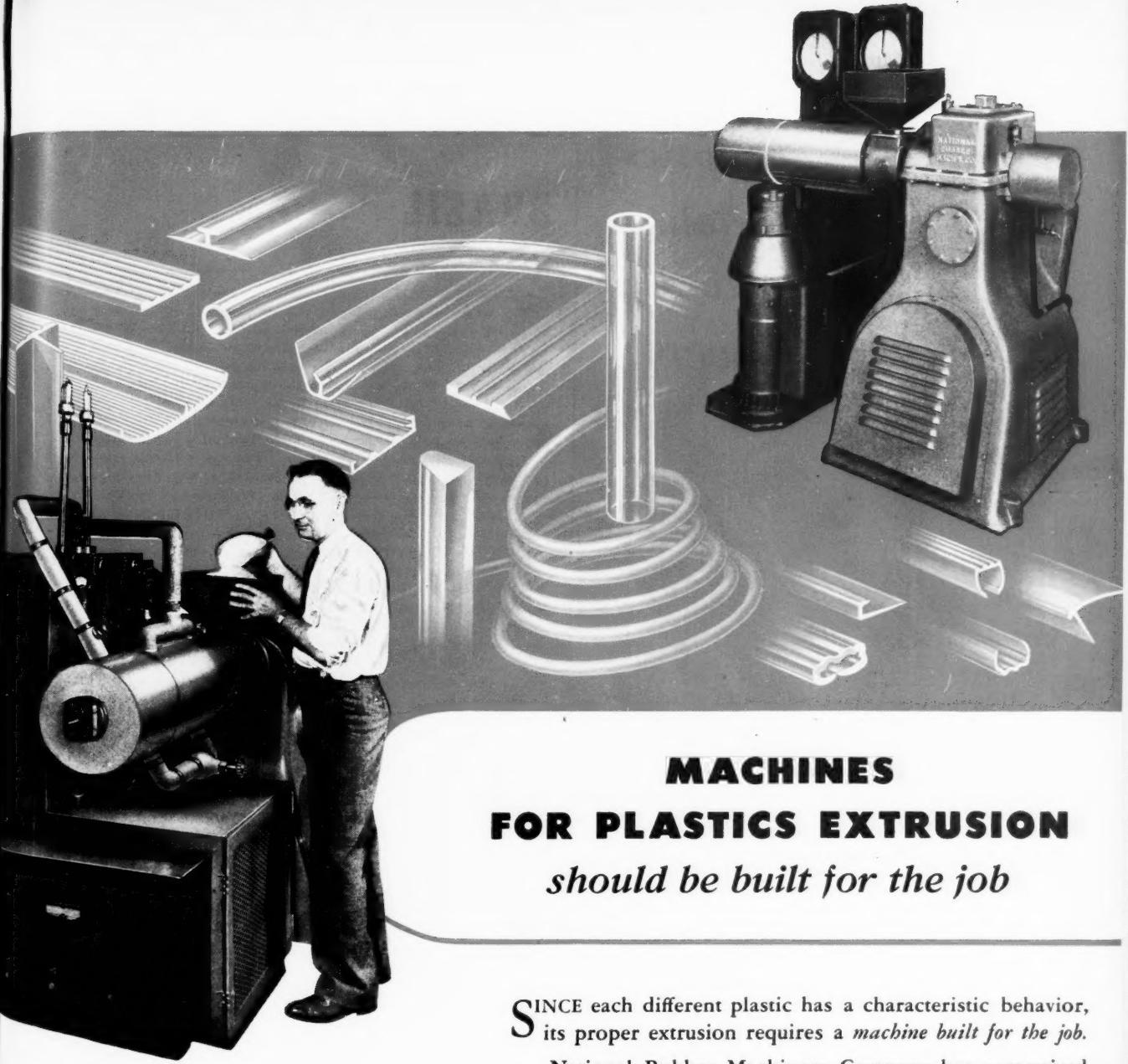
H. DEFECTIVE INNER TUBE.

Same comments apply with regard to results of analyses, tests, and measurements as given above under indoor wheel tests.

Tire and Tube Quotas for February, 1943*

United States and Territories Region	Passenger and Motorcycle, Etc.					Truck and Bus, Etc.			Farm Tractor and Implement	
	New Grade I Tires	New Grade II Tires	Grade III Tires	Recapping Services	Tubes	Tires	Recapping Services	Tubes		
No. 1										
Maine	760	1,378	3,963	5,033	4,372	2,572	3,054	2,406	294	
New Hampshire	466	913	2,512	3,292	2,821	1,188	1,934	1,303	115	
Vermont	361	528	1,826	2,060	1,871	988	968	849	125	
Massachusetts	3,989	5,922	19,690	23,143	20,682	6,270	5,702	5,226	268	
Rhode Island	789	1,152	3,948	4,551	4,091	1,261	1,190	1,067	39	
Connecticut	1,880	3,888	11,563	14,347	12,397	4,868	5,144	4,320	191	
Boston	Sub-Total	8,245	13,781	43,502	52,426	46,234	17,147	17,992	15,171	1,032
No. 2	New York State	13,751	14,352	51,842	58,748	54,656	19,616	15,729	15,575	2,118
	New Jersey	4,240	6,216	22,459	24,987	22,648	7,231	6,969	6,171	439
	Pennsylvania	8,902	17,771	49,142	64,711	55,139	19,501	21,368	17,585	1,970
	Delaware	365	569	1,564	2,050	1,794	830	938	759	99
	Maryland	3,591	4,681	11,121	15,944	14,073	5,783	4,970	4,714	384
	District of Columbia	3,128	1,115	3,505	5,060	5,266	1,349	1,246	1,131	..
New York	Sub-Total	33,977	44,704	139,633	171,500	153,576	54,310	51,220	45,935	5,010
No. 3	Ohio	8,734	15,371	43,696	56,021	48,665	15,886	14,933	13,405	3,398
	Kentucky	2,710	4,554	10,759	15,593	13,302	5,515	5,056	5,711	451
	West Virginia	1,422	2,626	6,444	9,082	7,725	4,304	5,990	4,348	134
	Michigan	7,562	10,271	36,625	40,842	37,360	12,421	8,701	9,401	2,211
	Indiana	4,276	7,920	19,709	27,558	23,453	10,275	9,960	8,790	2,773
Cleveland	Sub-Total	24,704	40,742	117,233	149,096	130,510	48,401	47,640	41,655	8,967
No. 4	Virginia	3,043	4,919	12,299	17,417	14,892	8,076	10,754	7,981	500
	North Carolina	3,373	5,091	13,847	18,881	16,248	9,963	15,168	10,535	500
	South Carolina	2,050	2,496	7,476	9,382	8,463	4,041	5,379	3,993	250
	Georgia	2,860	3,835	11,286	14,201	12,705	8,122	11,617	8,321	550
	Florida	2,560	3,429	10,538	12,977	11,628	7,218	9,129	6,948	351
	Tennessee	2,755	4,140	10,343	14,483	12,563	7,741	9,900	7,476	450
	Alabama	2,994	4,307	9,300	14,788	12,495	6,343	9,555	6,528	500
	Mississippi	2,042	2,174	5,478	7,666	6,934	5,620	5,935	4,986	1,000
Atlanta	Sub-Total	21,677	30,391	80,567	109,795	95,928	57,124	77,037	56,768	4,101
No. 5	Missouri	5,188	5,760	18,699	22,197	20,490	10,076	11,242	9,160	1,708
	Kansas	2,693	3,598	11,884	13,894	12,610	7,420	6,861	6,226	3,192
	Oklahoma	3,638	3,974	11,522	14,803	13,472	8,108	7,337	6,744	1,818
	Arkansas	1,637	2,042	5,364	7,113	6,260	5,545	6,524	5,165	550
	Texas	10,162	10,379	31,665	39,152	36,272	26,201	21,762	21,080	5,800
	Louisiana	2,890	2,522	8,252	9,835	9,347	6,532	5,168	5,147	372
Dallas	Sub-Total	26,208	28,275	87,386	106,994	98,451	63,882	58,894	53,522	13,440
No. 6	Illinois Excl. Met. Chicago	4,387	7,055	22,279	26,690	23,701	11,182	6,617	8,017	4,618
	Met. Chicago	4,863	5,110	19,694	21,818	20,278	7,721	5,369	5,829	140
	Iowa	3,216	4,196	15,638	17,151	15,745	7,159	4,313	5,161	4,841
	Nebraska	1,782	2,113	7,158	8,289	7,619	5,393	3,294	3,907	2,373
	North Dakota	704	877	3,268	3,548	3,293	2,002	1,072	1,394	1,659
	South Dakota	716	1,036	3,620	4,052	3,693	2,334	1,724	1,799	1,482
	Minnesota	3,438	4,142	17,015	17,443	16,442	5,560	3,821	4,181	3,493
	Wisconsin	3,510	4,866	17,815	19,550	17,907	5,234	5,022	4,458	2,698
Chicago	Sub-Total	22,616	29,495	106,487	118,541	108,678	46,590	31,232	34,746	21,304
No. 7	Montana	820	972	3,133	3,710	3,409	2,903	2,749	2,442	714
	Idaho	1,057	1,668	3,070	3,880	3,614	2,471	2,929	2,300	289
	Wyoming	414	491	1,558	1,853	1,705	1,513	1,147	1,168	224
	Colorado	1,895	2,702	8,138	10,098	8,994	5,161	4,102	4,062	691
	Utah	734	1,346	3,168	4,448	3,836	2,638	2,480	2,228	95
	New Mexico	648	675	2,060	2,606	2,375	2,779	2,474	2,297	200
Denver	Sub-Total	5,568	7,254	21,127	26,595	23,933	17,465	15,881	14,497	2,213
No. 8	Washington	2,376	4,040	12,820	15,419	13,576	5,200	5,563	4,640	404
	Oregon	2,268	3,211	8,982	11,622	10,305	7,383	7,101	6,295	438
	Northern California	5,225	8,952	27,390	33,592	29,479	11,678	15,976	11,697	540
	Southern California	6,392	12,954	39,648	48,603	42,076	9,226	11,642	8,882	225
	Nevada	258	350	1,002	1,425	1,195	1,357	1,110	1,086	37
	Arizona	766	1,000	2,908	3,709	3,313	3,447	3,110	2,840	125
San Francisco	Sub-Total	17,285	30,507	92,750	114,370	99,944	38,291	44,502	35,440	1,769
No. 9	Puerto Rico	495	248	971	1,224	1,177	679	343	465	48
	Virgin Islands	48	7	31	30	50	31	..	16	32
	Canal Zone	74	96	488	554	468	1,032	315	632	13
	Alaska	103	..	300	..	51	170	9	88	32
Washington, D. C.	Sub-Total	720	351	1,790	1,808	1,746	1,912	667	1,201	125
Total U. S. and Territories		161,000	225,500	690,475	851,125	759,000	345,122	345,065	298,935	57,961

* The quotas listed do not include reserve except in the farm tractor and implement quota where the total state quota is listed.



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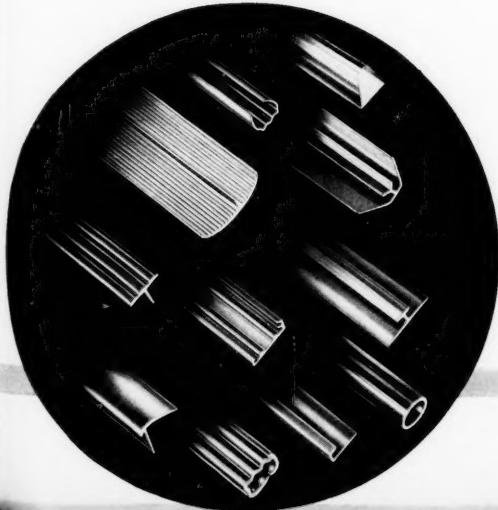
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LATIN AMERICA

BRAZIL

New Rubber Division

Among the several agricultural institutes which Brazil is establishing to aid in developing the country's natural resources is one at Belen, Para, to be devoted chiefly to rubber. Norman Bekkedahl, of the rubber section of the National Bureau of Standards, Washington, D. C., U. S. A., has been loaned to the Brazilian Government and will act as chief of the Rubber Technology Division of the Instituto Agronomico do Norte. Accompanying him is his assistant, Fred L. Downs. Before his departure for Brazil, Dr. Bekkedahl ordered the necessary equipment for an up-to-date rubber research and testing laboratory. The new laboratory will be of special importance to the United Nations as they have no other of this kind in the tropics, right at the very source of rubber.

Dr. Bekkedahl has done much work on the physiochemical and thermodynamic properties of rubber. In 1938 he was appointed by President Roosevelt to act as delegate for the United States at the Tenth International Congress of Chemistry, at Rome, Italy. He served as delegate of the National Academy of Sciences at the same conference and at the Thirteenth Conference of the International Union of Chemistry, and represented the Bureau at the International Rubber Technology Conference in London, England.

Mr. Downs served as student assistant in the rubber section of the Bureau and as chemist with the Thermoid Rubber Co., Trenton, N. J., U. S. A., where he became familiar with testing and control work. In 1935 he joined the staff of the electrical cable division of the American Steel & Wire Co., Cleveland, O., working on the development and testing of rubber insulation.

Fires Destroy Hereas

Authorities are much disturbed by the unusual number and extent of recent fires in the Amazon Valley which have been destroying large numbers of rubber trees. There have always been occasional jungle fires, but the frequency and volume of these recent ones suggest that it is not spontaneous combustion from the intense solar heat, but sabotage that is the cause. It seems significant that the greatest destruction occurs around Manaos, capital of the State of Amazonas, and in the Yaco and Pupus River regions, which have large Japanese populations, and Brazil has started an investigation to determine the real cause of the fires.

ECUADOR

Competing rubber exporters in Guayaquil have forced the local price of crude rubber to 430 sucres per quintal (about 60¢ per pound), which is above the price agreed upon by the United States and Ecuador. However the high price stimulated tapping by farm laborers, and unusually large amounts of rubber were collected in October, especially in the Province of Manabi, from which almost half the rubber exports came.

While the lure of high prices has induced farm laborers to tap rubber, beads, not money, tempt the Yumbo Indians of the Oriente region to abandon their easy life to search for and tap the rubber trees in the Oriente jungle at the head waters of the Amazon River. The needs of the Yumbo are very simple and easily supplied by the local *hunguara* palm, wild fruits, and plentiful game. Money has very little meaning for him, but beads, and then machetes and guns are highly prized. Consequently the Ecuadorian Development Corp., the joint United States-Ecuador agency for developing the economic resources in Ecuador, must have available quantities of beads of the preferred size and colors as well as other useful articles to trade with the Indians for rubber.

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HAITI

Other potential sources of rubber in Haiti, besides the recently announced *cryptostegia* development, are *Castilla* and *Hevea*. No rubber can be expected from newly planted *Hevea* for many years, whereas *cryptostegia* matures in six months, so the immediate interest is focused on this plant.

So far tapping of *Castilla* has been on an experimental scale only. The method usually followed in South America is to fell the tree, then ring the trunk and large branches with many cuts which may be one foot or only a few inches apart. Single large trees have been known to yield from 20 to 50 pounds of rubber, but this is not all the latex in the tree; it is estimated that probably several times as much latex as flows from the tapping cuts remains in the bark. In the past all this rubber was lost because, instead of drying and coagulating in the bark as would be the case with latex in *Hevea* logs, for instance, the latex in dead *Castilla* bark turns into a black sticky gum as a result of the action of an oxidizing enzyme. This enzyme also causes much damage to *Castilla* rubber, straining it black, and eventually reducing it to a soft sticky, inelastic paste.

In March, 1930, however, a discovery was accidentally made which may change the entire picture of the extraction of rubber from *Castilla*. Logs felled almost three years earlier were unexpectedly found to contain elastic threads of a pale amber color instead of the usual sticky, black inelastic mass. This exceptional occurrence of good rubber in *Castilla* bark was held due to the fact that the logs were in an open space, fully exposed to the sun so that the heat destroyed the oxidizing enzyme, thus permitting normal coagulation. That exposure to the sun kills the enzyme seems to be borne out by the fact that samples of *Castilla* latex spread on leaves and left to coagulate in the sun did not deteriorate when stored; whereas samples subjected to various other treatments to protect them turned to paste in a few months, others in a few years.

This discovery suggests possibilities not earlier recognized, which would include mechanical extraction of the rubber. It is suggested that the *Castilla* industry could be developed by forestry methods, and after the trees were felled a simple heat treatment would destroy the enzyme and coagulate the latex in the bark. Then would follow extraction by mechanical means similar to, but simpler than the process used for guayule extraction, since *Castilla* has its latex in tubes in the bark and not in cells scattered through the tissues, as in guayule. In this way the yields of rubber per tree would be increased considerably above present levels, and costs of production decreased.

PERU

To insure most efficient development of the rubber program, as provided by the agreement between the Peruvian Government and the Rubber Reserve Co., all transactions in rubber and elastic gums have been centralized in the Peruvian Amazonian Corp. A decree of October 9, 1942, grants this organization exclusive authority to buy and sell these products, and all holders of rubber or elastic gums and derivatives were ordered to report all their stocks to the corporation within 30 days.

It is learned that the plans of an American company to establish a branch tire factory in Peru are now about to be realized. In the third quarter of 1942 machinery and equipment arrived, and construction work on the factory began.

NICARAGUA

Nicaragua has just received one million rubber seeds. One-third will be sent by the Minister of Agriculture, Jose Maria Zelaya, to the agricultural station; while the Firestone plantations will get the rest for planting in the Lake Nicaragua region.

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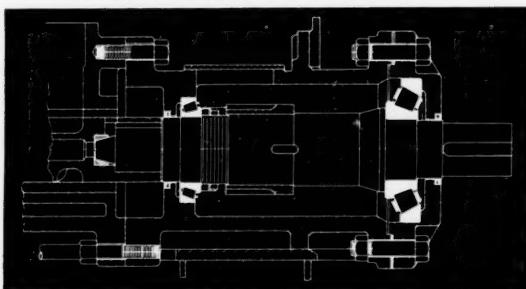


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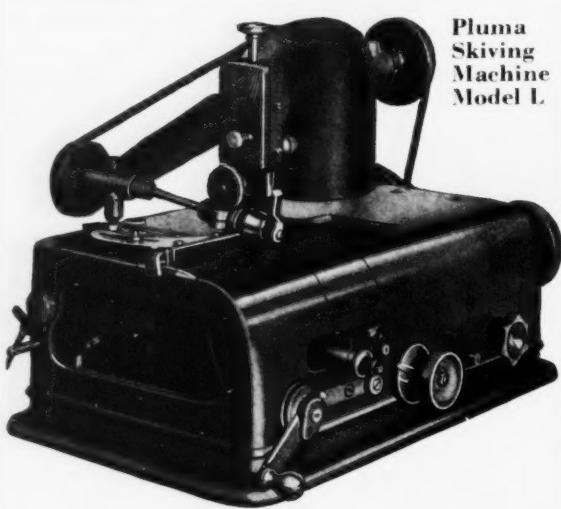


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This machine is equipped with a steel feed roll especially suited for this class of work, also with a power top presser roll having a double end bearing. It has an improved gear driven grinder, which eliminates belt troubles, where water is used on the knife head parts. These features, together with a knife six inches in diameter, enable the operator to skive a uniform wide bevel scarf. It can also be fitted for a narrow scarf if desired. A water device for wetting the knife when used for skiving rubber is also provided.

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FAR EAST

JAPAN

Accounts as to what is happening in the rubber countries of the Far East now under Japanese control have been received from various sources and show certain understandable differences. According to reports received by Washington and held to be reliable, most plantations in Netherlands India had ceased operating and as late as June, 1942, were still not operating because they had no way of disposing of the product and, moreover, were not allowed to draw money from the bank to pay their workers. Whatever rubber was shipped out of the country by the Japanese was chiefly rubber that had already been on hand. An English source confirms this point, but adds that small native owners, who work their holdings themselves, have continued to tap. In the past native small holders produced more than half the total Netherland India output, which, according to International Rubber Regulation Committee figures, should have been well over 600,000 tons in 1942; hence if the majority of native small holders are still producing, the Japanese would be able to obtain far larger quantities of rubber than they themselves can use, even if all the European plantations were closed.

The Japanese, on their side, claim that production of rubber has not been curtailed; it must in fact continue in order to prevent general unemployment in the rubber centers. They say they are now employing 400,000 laborers on Sumatra and Malayan plantations. The Agricultural Experimental Station in Medan, now managed by Japanese, is directing the big rubber estates in North Sumatra, as: Rubber Cultur Mij. (Amsterdam), United States Rubber Co., the H.V.A., and Goodyear. Incidentally the Japs announce that the Goodyear factory at Buitenzorg, where part of the equipment had been destroyed before the Japanese occupation, as well as such stocks of zinc oxide, accelerators, and other rubber chemicals as it had not been possible to remove, is now working to capacity.

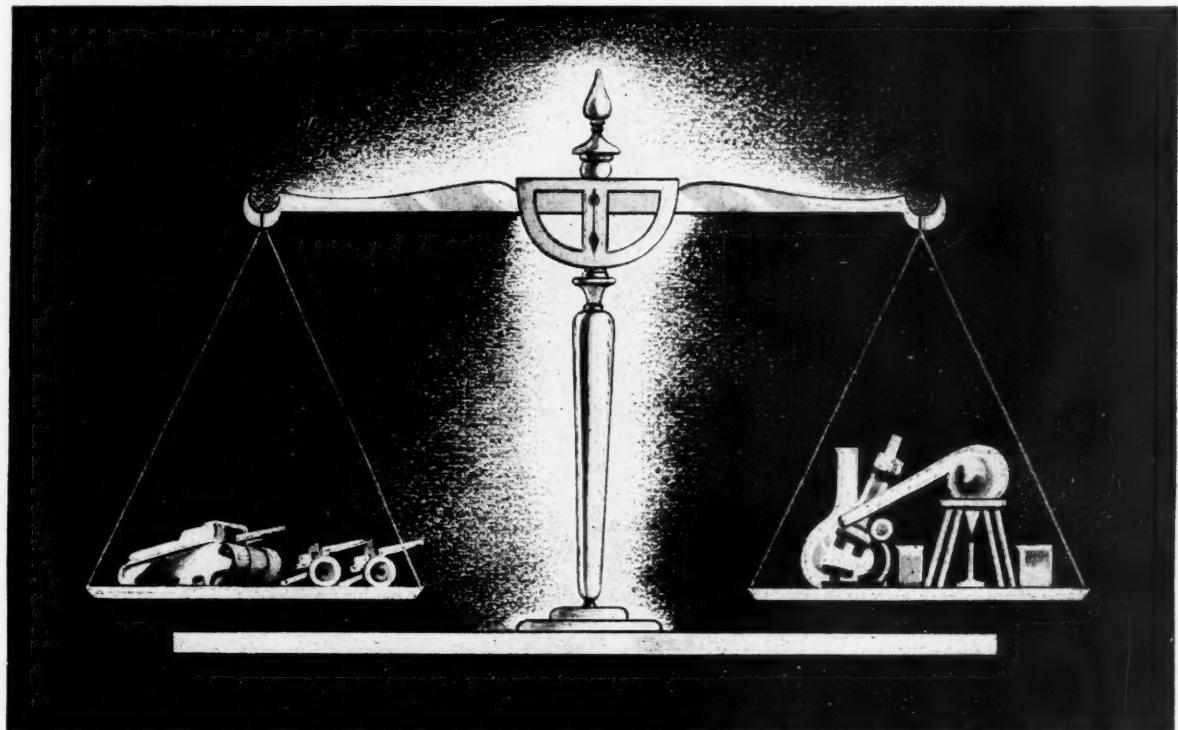
German sources state that the surplus rubber will not only be used as a base for motor fuel, but also to take the place of leather; further that Japanese plan eventually to supply continental Asia and later on also friendly European powers overseas, and that they are preparing for this export business by storing part of current output.

Despite the vast rubber areas at Japan's disposal, work on synthetic rubber continues with unabated energy. The Scientific Research Institute of the Kyoto Imperial Institute has developed a new method of making synthetic rubber. No particulars have been learned except that a two-step method is followed, as compared with the Russian three-step method based on alcohol, and the German four-step method based on acetylene.¹

Whether the Nipponees claims of natural rubber production are exaggerated or not, the enemy is certainly in a position where he not only could have enough rubber for his own use, but also a considerable surplus to sell to Axis friends. Washington, it is learned, gives credence to reports that Japan has been supplying Germany with raw rubber via Vichy African ports and is admittedly concerned over this development. Last summer Germany was receiving raw rubber from South America through Argentina, but a stop was put to this when 15 South American countries agreed to sell to the United States all the rubber they produced except what was required for domestic needs. The change that has taken place in Africa, which now favors the United Nations, gives reason to expect that Japanese rubber shipments will also soon be effectively stopped.

Incidentally, it appears that in spite of all the work done on synthetic rubber by the Germans and all the synthetic rubber that they have produced, Germany still cannot manage to produce tires without natural rubber. Reports state that German army tires captured in North Africa had treads of synthetic rubber, but the sidewalls were of natural rubber.

¹ German method requires five steps to produce rubber.—EDITOR.



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INDIA

Development of Plastics Industry

At a recent meeting of the India Chemical Society in Baroda, Sir S. S. Bhattacharjee discussed the possibilities of a plastics industry in India and outlined some of the work already done. South India is a large producer of coffee, but war restrictions have considerably reduced exporting possibilities; thus local coffee growers, like those in Brazil, have been forced to seek new outlets for their surplus crops. Like Brazil, India has developed a method of producing a molding material from coffee beans, said to yield very strong products, which have good water resistance, take on a fine finish, and can easily be drilled, sawed, and machined.

A large variety of seed for oil is produced in India, and before the war a good export trade existed in oil-seed cake left after oil-extraction. This has practically ceased, and experiments indicate that by suitable treatment molding material can be produced which compares fairly well with phenol-formaldehyde products.

The extensive sugar-cane industry annually yields enormous amounts of cellulosic matter and lignin, as waste material. The government lately patented a process by which as much as 19% of resin can be obtained from the bagasse with little chemical treatment. The resin is a dark brown, brittle, lustrous mass, with good binding and waterproofing properties and a melting point which varies widely, but averages about 148° C.

At present fair amounts of phenol and cresylic acid are produced by the Baraee Coke Works and the Shalimar Tar Products; further phenolic by-products will probably result in connection with the manufacture of toluene started by the Tata concern. However these industries will have to be still further developed if adequate amounts of phenolic substances are to be produced. Methyl and ethyl alcohols are available in quantities for producing the necessary formaldehyde; two pilot plants are already manufacturing some formaldehyde; furthermore good yields of furfural have been obtained from rice husks; besides there are many other types of cheap cellulosic materials from which furfural could be cheaply produced.

Both Assam and Rawalpindi use a cracking process in the local petroleum industries, which would provide the required basic materials for developing styrene and synthetic rubber products.

An abundance of carbon dioxide is available, and limited amounts of ammonia are also manufactured; both materials are needed for making urea formaldehyde resins. Ample amounts of glycerine are produced as by-products in the manufacture of soap. Finally the jute and cotton industries provide large quantities of waste material for which suitable outlets must be found and could be provided by the manufacture of molded products.

For Greater Output of Rubber

India is to have a Rubber Production Board to encourage maximum production of rubber by intensifying tapping, new planting, improved methods of cultivation and scientific research. The ban on new planting has accordingly been lifted, and the possibilities of various rubber-bearing plants are being investigated. The Imperial Council of Agriculture is experimenting with guayule and *kek-sauy* seed supplied by the United States and Great Britain.

All this will naturally hardly solve the immediate rubber problem; it is doubtful whether intensified tapping will yield much more rubber, as South Indian trees are known to be poor producers and are susceptible to *phytophthora* leaf disease. In addition the heavy and prolonged rains in the rainy season seriously interfere with tapping. It has been estimated that the rains are responsible for an annual loss of 60 pounds of rubber per acre.

In any event, the amount of rubber planted in South India is comparatively small. Figures for 1940, the last available, show that with permissible export at 83 1/4% and basic quota of 17,750 tons, exports were 13,915 tons and home consumption 8,967 tons. A large proportion of this rubber was supplied by Burma; so that present net Indian outputs must necessarily be lower than the 1940 total. When it is further considered that India's own consumption of rubber is growing, it becomes clear that the amount of rubber available for export cannot for some time be expected to rise above the 1940 figure.

EUROPE

GREAT BRITAIN

I. R. I. News

December 14, 1942, the London Section of the Institution of the Rubber Industry held a symposium on oil and thermal reclaim, when the following papers were presented: "Some Aspects of Thermal Reclaim Process", A. J. Hughes and P. H. Amphlett, Dunlop Rubber Co.; "New Processes and Their Relative Merit", E. W. R. Owen, John Bull Rubber Co.; "Comparative Review of Oil and Thermal Reclaiming Conditions", H. B. Fraser, North British Rubber Co.; "Sixty-Minute Reclaim", F. H. Cotton; "Some Problems Arising in the Manufacture and Uses of a Chemical-Thermal Reclaim", A. A. Cressall.

Other scheduled gatherings follow: December 15, Leicester Section, "Modern Developments in the Plastics Industry", by M. D. Curwen, editor of *Plastics*. January 11, 1943, London, "Organic Loading Fillers Which Substitute Rubber", T. R. Dawson. February 8, London, "Practical Processing of American Synthetic Rubber", B. J. Habgood and T. J. Watts. March 8, London, Symposium on "Rubber-Like Dispersions and Emulsions."

Plastics for Dentures

The prohibition of the use of rubber in the manufacture of dentures has brought to the fore the merits of plastics based on methyl methacrylate as substitute for vulcanite. In this type of plastic the solid polymer can be fluxed or swelled by the liquid monomer or related monomer, yielding a dough-like material almost as easy to handle as vulcanite. When the material is heated in a mold, curing or setting is achieved by the polymerization of the liquid monomer component to the solid polymer.

Since the outbreak of the war much progress has been made in the use of this plastic in the form of jacket crowns, inlays, and fixed bridges, which are said to withstand mastication stresses well and neither stain nor break.

Certain slight difficulties are still experienced in processing the material, but it is expected that further experience will reveal means of overcoming them so that the plastic will be at least as easy to handle as vulcanite. Meanwhile, despite this small handicap, dentists seem well pleased with the plastic, preferring it to vulcanite.

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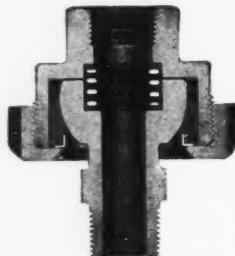
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Waste and Reclaim Rubber Restrictions

The Control of Rubber (No. 18) Order, governing waste and reclaimed rubber, issued by the Minister of Supply, went into effect November 5, 1942. It provides that waste and reclaimed rubber may be acquired only by certified waste rubber merchants or other persons who deal in waste rubber, persons collecting waste rubber on behalf of a local authority for salvage purposes, or those who have obtained the necessary license permitting them to do so. The use of waste and reclaimed rubber is also subject to license, and burning or destroying rubber is prohibited.

The Control of Rubber (No. 5) Order which formerly fixed price levels for waste rubber is now revoked, and maximum prices for different types of waste rubber have been fixed in Order 18; the amounts that may be charged for reclaiming waste rubber have also been limited. A detailed list is given of the various types of waste rubber and the maximum prices chargeable, which are considerably above the former flat rates.

Persons who own or hold more than five hundredweight of waste rubber must report the approximate amounts as well as the location of their stocks, to the Control Board within 21 days.

Joint Council of Professional Scientists

A Joint Council of Professional Scientists, representing more than 10,000 qualified scientists, has been set up by the Institutes of Chemistry and Physics in association with representatives of professional botanists, geologists, mathematicians, and zoologists. The Council has been established to voice the collective opinion of qualified scientists on matters of public interest, to provide a liaison between professional organizations of scientists for coordinated action in matters of common interest, and in particular to concern itself with:—(a) the utilization of scientists to the best advantage in the service of the community; (b) the education, training, supply, and employment of scientists; (c) the better understanding of the place of scientists in the community; (d) the maintenance of adequate qualifications and ethical standards among professional scientists; (e) the supply of information and advice to public and other bodies on matters affecting scientists.

Members of the Council follow: representing the Institute of Chemistry: J. J. Fox (president of the Institute), Alexander Findlay, D. Roche Lynch, Sir Robert Pickard (chairman of the new organization), H. A. Tempany, R. B. Pilcher (registrar and secretary of the Institute); representing the Institute of Physics: Sir Lawrence Bragg (president of the Institute), J. A. Crowther, E. R. Davies, B. A. Keen, H. Lowery, H. R. Lang (secretary of the Institute); representing botanists: W. Brown; representing zoologists, D. Keilin; representing mathematicians, S. Chapman; representing geologists, H. H. Read.

The Joint Council has been established for the period of national emergency, but it may form the nucleus of some permanent organization to facilitate the close collaboration between professional men and women practicing in all branches of science.

Notes

Whether surplus West African cocoa could not be used in the production of plastics was a recent question before the House of Commons during a discussion of the surplus cocoa now uselessly held in West Africa. Up to September 30, 1942, about 23,500 tons of the 1941-42 crop, about 6% of the whole, have had to be destroyed.

A new overboot has been devised for members of industrial and public utility A.R.P. services to take the place of high rubber boots, no longer available. The new boot, oilskin with rubber sole, will reach to the knee and can be worn over ordinary boots and shoes. It comes in only two sizes: large for men and small for women. No coupons will be required from firms buying these boots for their A.R.P. personnel.

Owing to the rapid development of its plastics section, the firm of Thomas De la Rue has decided to transfer it to a separate company, De la Rue Plastics, Ltd., capitalized at £1,000,000.

A. Healey, works director of the Dunlop Rubber Co., Birmingham, and vice chairman of the India Tire & Rubber Co., Inchinnan, and G. E. Beharrell, vice chairman of the Dunlop Rim & Wheel Co., and director of equipment sales at Birmingham, have been appointed directors of the Dunlop Rubber Co.

Editor's Book Table

BOOK REVIEWS

"Industrial Instruments for Measurement and Control." Thomas J. Rhodes. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York, N. Y. Cloth, 6 by 9 inches. First edition. 573 pages. Index. Price \$6.00.

This comprehensive text should be of particular value at this time to all concerned with instrument and control problems in industry when tremendous new plants are being designed, built, and operated to produce synthetic materials on a scale never before attempted in this country. The solution of problems of increased complexity involved in the design, installation, and maintenance of instruments and controls for these new plants and processes should be greatly aided by the information contained in this volume.

Information on instruments used for the measurement and control of the four basic physical and thermal quantities in industrial processing and manufacture, namely, temperature, pressure, fluid flow and liquid level, are fully covered in a theoretical and practical way. After a discussion of the standards necessary for the testing and calibrating of industrial instruments, pressure and vacuum gages, indicating and recording thermometers, and high temperature pyrometry are covered in considerable detail. The very important and complex subject of the measurement of the flow of liquids requires about one-fourth of the book since the accurate control of the flow of materials and information necessary to determine distribution of materials for cost control would be impossible without proper instruments for the measurement of this property in continuous processes. Liquid level measurements and telemetering are also discussed.

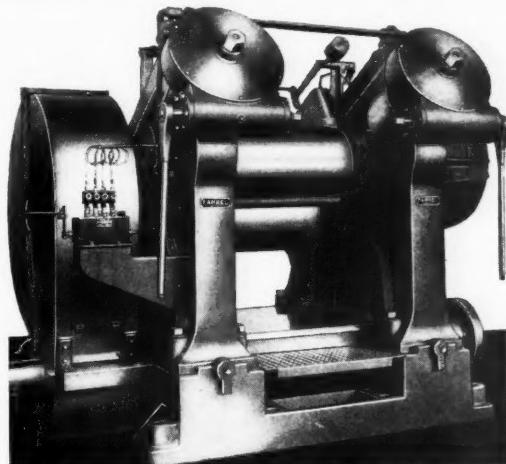
Automatic-control theory, the mechanical technique of integrating the responses obtained from the primary measuring instruments and producing the necessary counterresponses to maintain a state of balance in the process under control, is covered thoroughly and mathematical treatment is included where required for clarity. The explanation of automatic-control mechanisms is one of the few places in the book in which descriptive material on the available types and kinds of instruments is included. In this case it is necessary in order to make clear the theory underlying the use of these instruments for this purpose.

The book concludes with a chapter on miscellaneous industrial instruments among which are discussed the continuous CO₂ gas analyzer, hydrogen ion concentration meter, humidity recorder, and the automatic cycle controller. A table of orifice coefficients for use in the design of flow-meter orifices is included in the appendix.

"Plastics for Industrial Use. An Engineering Handbook of Materials and Methods." First Edition. John Sasso. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y. Cloth, 6 by 9 inches, 229 pages. Index. Price \$2.50.

This text represents a valuable contribution to the literature of plastics in that it gives the design engineer or production executive a clear, practical picture of the comparative properties, molding methods, and machining and finishing of plastic parts which may be made from any one of the various types of plastic substances. Chapters then follow which treat each specific plastic material separately with emphasis on properties and applications. Those plastics on the market at present are classified according to their origin and whether they are thermosetting or thermoplastic, and information on basic compounding materials is also included. The chemistry of the plastics is not dealt with except in cases where it has a direct bearing on the strength or performance of the product to be made. The principles of the design of molded plastic products are clearly discussed and illustrated as are the principles of the design of the molds required. The chapter on the widely used phenolic plastics is followed by a separate chapter on cast phenolics. Other chapters then discuss the use of urea, acrylic, polystyrene, vinyl, vinylidene chloride, cellulose acetate, and ethyl cellulose plastics.

In explaining laminated plastics, the advantages of the use of laminated phenolic plastics and rubber in combination for special purposes are shown. A comparison of vegetable mucilages and



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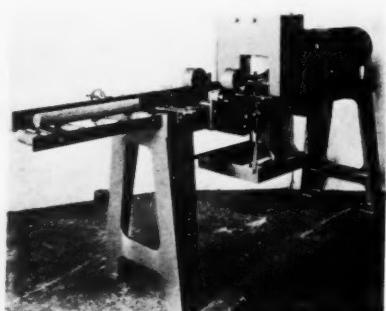


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animal glues with phenol and urea formaldehyde resin adhesives is given in the chapter on plywoods and adhesives. A directory of trade names, suppliers, and molders completes the book.

"Commodity Year Book (Master Edition)." Prepared and published by Commodity Research Bureau, Inc., 82 Beaver St., New York, N. Y. Cloth, 8½ by 11½ inches, 413 pages. Price \$7.50. **"Commodity Statistics (1942)."** Cloth, 8½ by 11½ inches, 294 pages. Price \$5.00. (Combination price for both volumes \$10.00.)

The Commodity Year Book series is now offered in two separate volumes, one the "Commodity Year Book (Master Edition)" and the other "Commodity Statistics (1942)." The comprehensive Master Edition presents separate articles on 836 different commodities practically all of which are now necessary for the military and civilian war effort, and includes detailed information on physical analysis, source of production, principal uses and finished products, actual and possible substitutes, etc. In addition to the discussion of rubber, synthetic rubber, guayule rubber, and detailed analysis of the plastics industry, other materials of interest to the rubber and allied industries, such as sulphur, titanium oxide, zinc oxide, selenium, aluminium, talc, rayon, turpentine and rosins, and many other materials are covered. Considerable space is devoted to the various types of synthetic rubbers, such as Buna, Butyl, neoprene, etc. This volume emphasizes to a considerable extent the progress that has been made in the production of synthetic materials. The subject matter on plastics prepared in cooperation with the Society of the Plastics Industry covers in some detail the molding processes used and also describes the composition, properties and uses of the major classes of synthetic and some natural resins.

"Commodity Statistics", the fourth annual edition of this standard reference work, enables many who have purchased previous year books to have up-to-date figures on the majority of statistical tables published in previous editions. Certain information and statistics have had to be withheld since their publication might be detrimental to the war effort but the publishers state that they hope to provide their readers with complete figures after the war.

NEW PUBLICATIONS

"Rubber, Polyisoprenes, and Allied Compounds. Part II. The Molecule-Linking Capacity of Free Radicals and Its Bearing on the Mechanism of Vulcanization and Photo-Gelling Reactions." E. H. Farmer and S. E. Michael. Publication No. 27. British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C. 3, England. 8 pages. Since it is known that when dibenzoyl peroxide is heated with rubber at 140°, interaction takes place and the rubber undergoes a species of vulcanization, the course of this reaction was studied by means of examining the behavior of dibenzoyl peroxide toward a typical olefin, cyclohexene. Numerous products, including C₆- and C₁₂-hydrocarbons and benzoates of these, are formed; the reaction involves the thermal decomposition of the peroxide to give free phenyl and benzoate radicals. These radicals lead to (a) the interlinking of the olefin molecules, and (b) the formation of derivatives of both the simple and the "polymeric" olefins. The olefin molecules are attacked by the radicals principally at the α-methylene groups, but in part at the double bonds. The results described not only disclose an important reactivity of olefins, but afford an explanation of numerous vulcanization reactions which rubber undergoes, and also certain photo-gelling reactions which are promoted by free-radical sources.

"All Out for Victory at Firestone." Firestone Tire & Rubber Co., Akron, O. 36 pages. This profusely illustrated booklet depicts the achievements and efforts of the Firestone company in furthering the war program. Drawings and photographs illustrate the wide scope of activities taking place in the manufacture of weapons for defense and attack, wartime rubber products, plastics products, and foamed latex and bound-hair products. A photographic list of merchandise now being sold by Firestone dealers, who no longer can depend on the sale of tires and tubes for an income, is included.

"The Compounding of Buna S." Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. (Report No. 42-4), 48 pages. The major part of this report on Buna S, or GR-S, by H. L. Lawrence deals with the effects obtained by the use of the various organic accelerators at different sulphur and accelerator ratios in compounding and curing this synthetic rubber. A résumé of the data presented in this report and an accompanying statement received with this report state that Thionex alone or activated with Accelerator 808 is the preferred acceleration for Buna S because of long-curing range and excellent all-round properties imparted to the vulcanizate. Thiazoline (2-MT) and dithiocarbamates are also classed as good accelerators; while thiazoles were not found to be particularly active unless activated with a secondary accelerator. The use of Neoprene GN or KNR as a fairly effective tackifier for Buna S is mentioned under the section on plasticizers. Graphs are included showing the modulus, tensile strength, hardness, resilience, and compression set of Thionex accelerated stocks containing channel, semi-reinforcing, and soft carbon blacks at various loadings. Since several different production lots of Buna S were used in the work, comparative data presented in the different tables do not check so closely as similar data would be expected to check if they were obtained from natural rubber compositions, it is stated.

"Farrel Roll Grinder." Bulletin No. 113. Farrel-Birmingham Co., Inc., Ansonia, Conn. 32 pages. This booklet describes the advanced design, construction, and operating advantages of the Farrel Type TT Roll Grinder with moving work table. This machine was developed to meet today's needs of high output and precision ground rolls with a minimum of skill on the part of the operator. Many important new features automatically assure, or greatly facilitate, accuracy in set-up and operation. The grinders are built in three sizes, to take maximum diameters of 24, 28, and 32 inches and in any length required. The new bulletin conveniently tabulates specifications, dimensions, and weights for each of the different sizes.

"Patents at Work." A Statement of Policy by the Alien Property Custodian of the United States." January, 1943. Office of Alien Property Custodian, Chicago, Ill. 28 pages. The United States Government, through the Office of Alien Property Custodian, now holds about 50,000 patents formerly owned by residents of enemy and enemy-occupied countries, which are now being offered for use by American industry. "Patents at Work" has been prepared to provide industry with a brief outline of the policies adopted for the administration of these patent holdings. Also included, in a separate four-page folder, is an index to the classified lists of vested patents for use as a guide in ordering.

"Seiberling Rubber Co. Annual Report for the Year Ended October 31, 1942." Seiberling Rubber Co., Akron, O. 28 pages. This booklet contains, besides the financial statement and report to stockholders, a very interesting pictorial presentation entitled, "Seiberling At War." Illustrated jointly are the manufacture and use by the armed forces of pontoon bridge floats, rubber landing boats, bullet-sealing gasoline tanks, military truck tires, and gas-mask face blanks and other rubber parts.

"Preliminary Evaluation of Columbia Pigments in Synthetic Rubbers." Pittsburgh Plate Glass Co., Columbia Chemical Division, Pittsburgh, Pa. 30 pages. This booklet contains basic data on the behavior of the Columbia pigments Silene and Calcene in comparison with Gastex carbon black, Suprex Clay #1, and Hydrated Alumina C-740 in six commercial synthetic rubbers; Buna S, Perbunan, Hycar OR, Neoprene GN, Butyl B, and "Thiokol" RD. No plasticizers were used in any of the stocks investigated, and under these conditions a 40-volume Silene stock was found to give comparable physical properties with a 30-volume Gastex stock in Buna S. Silene could be incorporated in Butyl rubber only with difficulty; Calcene showed better promise in this rubber. Silene is shown to have good reinforcing properties for Neoprene GN and to be useful in compounding Perbunan and Hycar OR. This material had about the same effect in "Thiokol" RD, and in addition Calcene was found to have better reinforcing properties in this rubber than in Perbunan or Hycar OR. This booklet is distributed through Standard Chemical Co., Akron, O., sales agent for Columbia chemicals to the rubber industry.

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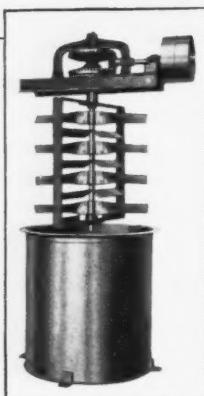
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"**Ambidex in Type-F Tires.**" Bulletin No. RA-101. Binney & Smith Co., 41 E. 42nd St., New York, N. Y. 3 pages. This bulletin deals specifically with the use of Ambidex, an activating plasticizer in formulations for Type-F reclaim tread stocks containing no crude rubber. Laboratory test results are given for stocks in which Ambidex functions only as an activator and in which 40 parts on 100 of rubber hydrocarbons of the reclaim of Standard Micronex or Micronex W-6 carbon black are used for reinforcement. Other results are also given covering increased loadings of Standard Micronex black in connection with additions of Ambidex running from five to 15 parts per hundred of rubber hydrocarbon; these results are used to show that the addition of Ambidex together with increased amounts of Micronex black produce stocks having physical properties similar to the control formulation and could be used to extend the stockpile of reclaimed rubber.

"**War Production in 1942.**" War Production Board, Washington, D. C. Issued by the Division of Information. 24 pages. This publication is a report to the American people by Donald M. Nelson, Chairman, War Production Board, of the work of this organization during the past year. In Part I, The First Year, an overall review of the effect of major national and international events on war production effort is given. Part II, The Major Problems, reports the situation on critical materials as it has been dealt with during the year and includes a summary of the outlook for the future. It is in this part that the problem of rubber supply is discussed. It is indicated that the recommendations of the Parche Committee Report are to be used as the main plan of action to meet this situation. It is stated that if the synthetic rubber program is successful and the tires now on the road are carefully preserved, the United States will defeat the rubber shortage by this time next year. If not, the rubber shortage may have defeated the United States is the final conclusion. Conservation of Materials, Priorities, Conversion of Industry, Small Manufacturers, Concentration of Industry, Construction and Facilities, Program Adjustments, and Labor's Part conclude Part II. Organizational Developments and a listing of the present duties of top-ranking personnel is given in Part III. This part concludes with the statement that the organization will change as war production problems change and states that the only thing that is certain is that the pledge of the President and the people to make America the arsenal of democracy will be fulfilled.

"**A Wartime Guide to Monsanto Plastics.**" Monsanto Chemical Co., St. Louis, Mo. 16 pages. This booklet was written primarily to help busy war production executives to get a clear, over-all picture of what plastics really are, what they are doing to help win the war, and what they promise in post-war progress. The booklet describes briefly the six basic types of Monsanto plastics and their possibilities and limitations, and it illustrates a few war jobs they are now filling. Saflex, developed from the group of synthetic resins known as vinyl acetals, has been used very successfully as a replacement for rubber in Army raincoats, water bags, etc., and also may be used for molded and extruded articles. Resinox thermosetting phenolic resins for heavy-duty molded article and Fibestos thermoplastic cellulose acetate resins for either injection or compression molding are also described. Lustron thermoplastic polystyrene plastic and Nitron thermoplastic cellulose nitrate plastic as well as some of the other types are compared as to physical and chemical properties in various tables.

American Society for Testing Materials, 260 So. Broad St., Philadelphia, Pa. "**Tentative Method of Test for: Water Vapor Permeability of Plastic Sheets**", A.S.T.M. Designation D 697-42T, issued 1942, 4 pages; "**Coefficient of Linear Thermal Expansion of Plastics**", A.S.T.M. Designation D 696-42T, issued 1942, 8 pages; "**Compressive Strength of Plastics**", A.S.T.M. Designation D 695-42T, issued 1942, 4 pages. "**Waco Catalyst**," Volume VI, 1942, Wilkens-Anderson Co., 111 N. Canal St., Chicago, Ill. 24 pages. "**Inspected Electrical Equipment**," Supplement to May, 1942, List, November, 1942. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. 64 pages. "**Zinc in War from Mine to Battlefront**," New Jersey Zinc Co., 160 Front St., New York, N. Y. 4 pages. "**Varnished Cambric Insulated Power Cables**," Simplex Wire & Cable Co., Cambridge, Mass. December, 1942. 4 pages.

(Continued on page 522)



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 2,304,267. Applicator and Combined Closure Having an Elastic Body Provided with a Hollow Bulb. R. E. McElroy, Greensboro, N. C., and H. O. West, Narberth, Pa., assignors to Vick Chemical Co., New York, N. Y.
 2,304,292. Refrigerator Cabinet Construction Utilizing a Throat Rubber. D. D. Wile, Utica, assignor to Savage Arms Corp., New York, both in N. Y.
 2,304,483. Non-Breakable Pole Line Insulator Comprising an Integral Body Composed of a Soft Vulcanized Rubber Compound. D. H. Smith, Hempstead, N. Y., and H. H. Wheeler, Millburn, N. J., assignors to Western Union Telegraph Co., New York, N. Y.
 2,304,532. Resilient Sealing Cap for Air Vent on a Nursing Bottle. J. H. Boxley, Richmond, Va.
 2,304,581. Apparatus to Apply Trim Rings to Wheels, Utilizing a Circular Rubber Deflecting Means. G. A. Lyon, Allentown, N. J.
 2,304,650. Piston with an Annular Semi-Solid Packing Element Composed of Rubber-Like Homogeneous Substance. H. S. Pardee, Ravinia, Ill.
 2,304,656. Textile Spinning Cot Having a Fiber Contacting Surface Layer Consisting of a Vulcanized Resilient Composition (Acrylic Nitrile or Butadiene Copolymer Synthetic Rubbers) and a Vulcanizing Agent as Sulphur. J. Rockoff, assignor to Dayton Rubber Mfg. Co., both of Dayton, Ohio.
 2,304,699. Inflatable Shoulder Pad for Gun Bearers, Etc. H. Levy, New York, assignor to one-third to J. Kruleck, Bronx, and one-third to B. Zwicker, New York, both in N. Y.
 2,304,708. Douche Device. H. C. Ritter, Jersey Shore, Pa., assignor of one-tenth to H. F. French, Troy, one-tenth to J. F. Matthews, Williamsport, two-tenths to J. C. Patchen and G. H. Patchen, both of Cogan Station, one-twentieth to C. K. Derr, one-twentieth to H. S. Reese, one-tenth to L. O. Tirrell, all of Williamsport, all in Pa., one-tenth to W. B. Grossman, Canaseraga, N. Y., and one-tenth to E. J. Corson, Jersey Shore, Pa.
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 2,304,870. Electric Coupling with a Ring of Yieldable Material Carried by a Cup-Shaped Shell. K. M. Yost, Beloit, Wis., assignor to Warner Electric Brake Mfg. Co., South Beloit, Ill.
 2,305,044. Conveyor and Elevator Belt with a Rubberized Coating on Which Is Formed Rubber Rib. E. E. Towey, assignor to Rub-R-Slat Co., both of Halstead, Kan.
 2,305,073. Slipper Bearing with Resilient Yieldable Members. T. L. Gatke, Oak Park, Ill.
 2,305,173. Sponge Rubber Pillow Head Rest. J. S. Leeb, Baltimore, Md.
 2,305,215. Sealing Boot Assembly Including an Annular Flexible Boot. R. G. Le Tourneau, Peoria, Ill., assignor to R. G. Le Tourneau, Inc., Stockton, Calif.
 2,305,282. Swab Cup Construction Including a Flexible Cup Body. R. G. Taylor, Jr., and D. B. Hooser, assignors to Guiberson Corp., all of Dallas, Tex.
 2,305,289. Surgical Appliance with Suction Means to Bound a Field of Operation. H. Coberg, Delmenhorst, Germany; vested in the Alien Property Custodian.

- 2,305,304. Bathing Trunk Having Incorporated Therein a Heavy Rib Elastic Belt Material Portion. A. P. Pescara, Genoa, Italy; vested in the Alien Property Custodian.
 2,305,325. Rubber Covered Wire with a Bituminous Impregnated Textile Covering. P. M. Snyder, Ben Avon, assignor to H. H. Robertson Co., Pittsburgh, both of Pa.
 2,305,419. Inflatable Athletic Game Ball. C. J. Crowley, New Haven, assignor to Seamless Rubber Co., Inc., both of New Haven, Conn.
 2,305,430. Mattress, Cushion, Etc., Including Sponge Rubber Pads. M. Karpen, Los Angeles, and H. Bows, Huntington Park, Calif., assignors to S. Karpen & Bros., Chicago, Ill.
 2,305,431. Electric Cable Comprising a Plurality of Insulated Conductors, Including an Insulation Layer of Rubber. G. Koger and J. D. Lowe, Bridgeport, Conn., assignors to General Electric Co., a corporation of N. Y.
 2,305,453. Membranes of Rubber, Etc. Z. Martos, Budapest, Hungary; vested in the Alien Property Custodian.
 2,305,509. Corset. L. J. A. Amyot, Quebec, P. O., Canada.
 2,305,582. Amputation Ice Chest with an Inflatable Cuff Embracing a Limb Inserted into the Box. J. A. Kennedy, Bronx, and J. Kish, assignors, by direct and mesne assignments, to J. D. Gordon, all of New York, N. Y.
 2,305,605. Insulating, Protective, and Buoyant Suit. E. C. Craig, United States Navy, and G. W. Leyde, Arlington, Va.
 2,305,606. Insulating, Waterproof, and Buoyant Overcoat. E. C. Craig, United States Navy, and G. W. Leyde, Arlington, Va.
 2,305,607. Protective Lifesaving Vest and Buoyant Collar. E. C. Craig, United States Navy, and G. W. Leyde, Arlington, Va.
 2,305,631. Opening Device for a Package, Comprising an Outer Protective Layer and an Inner Transparent Rubber Hydrochloride Layer. G. A. Moore, New York, N. Y., assignor to Shellmar Products Co., Mount Vernon, O.
 2,305,644. Radio-Shielded Conduit Having a Flexible Tube of Rubber-Like Material. R. H. Stone, Bound Brook, N. J., assignor to Titiflex Metal Hose Co., a corporation of N. J.
 2,305,667. Guideway for Machine Gun Ammunition Belts. G. C. Brentnall, Erdington, Birmingham, assignor to Dunlop Rubber Co., Ltd., London, both in England.
 2,305,716. Ophthalmic Mounting, Including a Pair of Nose Pads. G. P. Kimmel, Brookville, Md.
 2,305,736. Pant-Girdle. A. Rhea, assignor to Julius Kayser & Co., both of New York, N. Y.
 2,305,784. Device for Treating Teeth, Gums, and Facial Muscles. I. Horvath and S. Zagonyk, both of Budapest, Hungary; vested in the Alien Property Custodian.
 2,305,795. Resilient Connection Between Chassis and Vehicle Front Wheel. G. H. Schieferstein, Einowfurt, Germany; vested in the Alien Property Custodian.
 2,305,804. Acid Resistant Laminated Floor Covering Comprising a Floor Base, a First Layer on the Base Comprising a Synthetic Resin and Hydraulic Cement, a Second Layer of Rolled Plates of Polymerized Vinyl Derivatives, and a Third Layer Composed of Ceramic Tiles Adhesively Secured thereto. E. Beutz, Koblenz, H. Burck, Baumbach, F. Heinrich, Selters, and J. Jaemicke, H. Miedel, H. Knoop, and O. Schweitzer, all of Frankfurt a. M., all in Germany; vested in the Alien Property Custodian.
 2,305,814. Coupling between a Load Mass and a Reciprocating Element, Comprising an Elongated Rubber Coupling Member. G. H. Schieferstein, Einowfurt, Germany; vested in the Alien Property Custodian.
 2,305,819. Tire Tread Having a Flat Surface, and Saddle-Like Means Supporting the Rubber Tread on the Tire Body Comprising Reinforcing Members Extending to the Sides of the Tread, and Supporting Wedges of Rubber between the Reinforcing Members Whose Ends Are Folded Over and Taken Back into the Supporting Wedges. W. Vorwer, Wuppertal-Barmen, Germany; vested in the Alien Property Custodian.
 2,305,880 and 2,305,881. Oscillatory Connection for Automobiles, with a Resilient Bushing. J. W. Leighton, Port Huron, Mich.
 2,306,159. Electrical Conductor Having a Self-Contained Non-Saturant Single Elastic Film Composed Essentially of a High-Polymer Synthetic Resin Plasticized to Rubber-Like Consistency Closely Surrounding the Protective Jacket. O. A. Frederickson, Glen Ridge, N. J., assignor to National Electric Products Corp., a corporation of Del.
 2,306,246. Stocking with Elastic Thread Incorporated in the Upper Portion. R. E. Davis, assignor to W. B. Davis & Son, Inc., both of Fort Payne, Ala.
 2,306,444. Drain Opener with Sponge Rubber Sealing Gasket. J. Hubbard, San Antonio, Tex.
 2,306,488. Lifesaving and Protecting Suit. H. G. Morner, Stockholm, Sweden.
 2,306,511. Outdoor Changeable Letter Sign with Resilient Marginal Stripping. E. Wagner, Berwyn, assignor to Wagner Sign Service, Inc., Chicago, both in Ill.
 2,306,528. Bearing Structure. E. A. Davis and P. Jones, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.
 2,306,533. Electrical Conductor Having an Insulating Layer Comprising a Single Elastic Film Composed Essentially of High-Polymer Synthetic Resin Plasticized to Rubber-Like Consistency. O. A. Frederickson, Glen Ridge, N. J., assignor to National Electric Products Corp., a corporation of Del.
 2,306,570. Process to Protect and Color Concrete Using a Solution of a Member of the Group of Chlorine-Containing Rubber Derivatives and Vinyl Resins and Containing Liquid Chlorinated Diphenyl of Low Viscosity and an Alkali Fast Coloring Material, and a Finishing Coat of Alkali-Resistant Wax-Like Substance in Aqueous Dispersion. E. W. Scripture, Jr., Shaker Heights, O.
 2,306,577. Pneumatically Mounted Tractor. C. L. Walker, Piedmont, Calif.
 2,306,604. Stern Tube Construction for the Propeller-Shaft of a High-Speed Boat with a Rubber Shaft Bearing. H. Scott-Paine, Hythe, England.
 2,306,673. Combined Seat and Back Rest. H. T. Tucker, assignor to Tucker Duck & Rubber Co., both of Fort Smith, Ark.
 2,306,759. Apparatus for Improving Wing Siot Operation, Having an Inflatable Shoe. C. T. Sears, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
 2,306,864. Rubber-Faced Back Cloth and Anti-Scruff Device for an Adjustable Chair Back. O. S. Caesar, Barrington, Ill., and W. A. Duvall, Cleveland, O., assignors to Tropic-Aire, Inc., Chicago, Ill.
 2,306,914. Stocking Top Having Incorporated therein a Course of Elastic Threads. W. L. Smith, Jr., Pawtucket, assignor to Hemphill Co., Central Falls, both in R. I.
 2,306,946. Windshield Wiper. E. C. Horton, Hamburg, and A. Rappl, Buffalo, assignors to Trico Products Corp., Buffalo, all in N. Y.
 2,307,032. Orthopedic Footwear with Rubber Sole. A. Fisch, Guelph, Ont., Canada.
 2,307,043. Hermetically Sealed Container Having a Deformable Rubber Section for Indicating Spoilage of the Contents. J. M. Hothersall, Brooklyn, assignor to American Can Co., New York, both in N. Y.
 2,307,044. Liquid Dispenser with Resilient Closure Member and Resilient Container. T. Huston, Miami, Fla.
 2,307,066. Rubber Diaphragm of Varying Hardness and Flexibility. C. L. Paulus, Dayton, O.
 2,307,093. Insulated Refrigerator Cabinet with Resilient Sealing Gasket. O. H. Yoxximer, Springfield, Mass., and H. D. White, Adrian, Mich., assignors to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
 2,307,094. Refrigerator Cabinet Having a Resilient Sealing Gasket. O. H. Yoxximer, Springfield, Mass., assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
 2,307,114. Apparatus for Threading an Open End of a Plastic Body, Including a Conical Rubber Member on a Plunger Member. J. Dichter, Berlin-Schoneberg, Germany.
 2,307,159. Refrigerator Door and Resilient Gasket Construction. T. W. Rundell, Jenkins, assignor, by mesne assignments, to Philco Corp., Philadelphia, Pa.
 2,307,180. Vinyl Resin (Copolymer of Vinyl Chloride and Vinyl Ester of an Aliphatic Acid) Phonograph Records. V. Yingve, Lakewood, O., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.
 2,307,182. Golf Ball Having a Multiplicity of Uniformly Spaced Frusto-Conical Air Pockets. L. A. Young, Detroit, Mich.
 2,307,193. Laminated Golf Club Head Having a Number of Plies Provided with V-Shaped Notches Filled with Inserts of Compressible Material on the Striking Face of the Club. G. L. Bellis, Elcho, Wis.
 2,307,201. Seat Cover Construction with Trim Fabric Vulcanized thereto. G. R. Cunningham, Grosse Pointe Park, assignor to National Automotive Fibres, Inc., Detroit, both in Mich.
 2,307,224. Leakproof Applicator Closure for Dispensing Containers, Having a Resilient Sealing Gasket Member. R. B. Kingman, Orange, N. J.
 2,307,252. Stemming Dummy for Insertion in Blasting Holes for Sealing the Latter, Having a Cylindrical Compressible Gasket about a Tension Rod. F. Yakes, Jr., Lafayette, Colo.
 2,307,255. Boat Fender Comprising a Plurality of Flat Pieces of Tire Casing Material. H. W. Bell, assignor to Durable Mat Co., both of Seattle, Wash.
 2,307,279. Floating Shock-Proof Fork for Bi-

Cycles. Having a Rubber Cushioning Body Subject to Torsional Stress. H. W. Kranz, Lakewood, Ohio, assignor to Cleveland Welding Co., Cleveland, both in Ohio.

2,307,342. **Multiple Shoe Stiffener with Rubber Binding Agent.** E. H. Voigtman and H. B. Kellogg, both of Neenah, Wisconsin, assignors to Paper Patents Co., corporation of Wisconsin.

2,307,416. **Resilient Rubber Breathing Insole.** M. Margolin, Elgin, Illinois.

2,307,429. **Tractor with Water-Expling Assembly.** A. D. Steindiger, Fairbury, Illinois.

2,307,561. **Terminal Construction for Electrical Devices Incorporating Resilient Bushings.** W. M. Bailey, Tuckahoe, New York, assignor to Cornell-Dubilier Electric Corp., South Plainfield, New Jersey.

2,307,590. **Gyroscopic Unit Having Rubber Tension Members Incorporated with the Bearings to Resist Yieldingly Swiveling Movements of the Casing in Either Direction.** T. W. Kenyon, Newton, Massachusetts, assignor by mesne assignments to Sperry Gyroscope Co., Inc., Brooklyn, New York.

2,307,592. **Electrical Cord Terminal Having a Resilient Molded Body.** A. L. Kuhlman, Ann Arbor, Michigan.

2,307,607 and 2,307,608. **Stocking Top Having Elastic Yarns Incorporated therein.** H. B. Snader, Temple, assignor to Vanity Fair Silk Mills, Reading, both in Pennsylvania.

2,307,671. **Piston for Fluid Actuated Device Having a Cylindrical Rubber Tube.** H. M. Dodge, Wabash, Indiana, assignor to General Tire & Rubber Co., Akron, Ohio.

2,307,709. **Back Rest for a Cycle Seat, Having a Sponge Rubber Pad Covering.** P. Ooton, Hopkinsville, Kentucky.

2,307,727. **Tread Unit for Shoes with a Plurality of Spaced Recesses Constituting Suction Cups Insert from the Ground-Contacting Portion.** D. C. Hubbard, Auburn, Maine.

2,307,730. **Gas Mask Consisting of Felt with a Film Forming Latex Layer and Superimposed by a Rubber Layer.** H. J. Heribert, Riverdale, New York.

Dominion of Canada

409,977. **Driving Wad for Shotgun Cartridge.** Comprising a Plurality of Sheets of Paper Felt Impregnated with Natural Rosin, and Asphaltic Material (Tar, Asphalt, Mineral Rubber or Bituminous Materials), and a Plasticizer of Sulfonated Castor Oil; the Sheets Are Joined by a Sheet of Fabric Impregnated with Rubber. Canadian Industries, Ltd., Montreal, Quebec, assignee of A. G. Robb, Deer Park, Victoria, Australia.

409,057. **Dress Shield.** A. Stein & Co., Ltd., Toronto, Ontario, assignee of C. J. Geimer, Chicago, Illinois, U. S. A.

409,210. **Automobile Window Assembly with a Rubber Channel Frame.** General Motors Corp., assignee of R. H. Dean, both of Detroit, Michigan, U. S. A.

409,335. **Multiple Plate Glass Having Plastic Layers of Graduated Thickness.** Duplate Safety Glass Co. of Canada, Ltd., assignee of R. E. Richardson, both of Oshawa, Ontario.

409,356. **Resilient Mounting with the Resilient Material in Shear.** Lord Mfg. Co., assignee of H. C. Lord, both of Erie, Pennsylvania.

409,389. **Piston Packing Comprising a Rubber Ring with a Reinforcing Core.** C. E. Goldcup, inventor, and Stanhay, Ltd., assignee of one-half of the interest, both of Ashford, Kent, England.

409,477. **Garment Band Comprising a Highly Elastic Rubber Strip Encased in a Sheath of Stretchable Textile Material.** Faultless Mfg. Co., assignee of H. Hardie, both of Baltimore, Maryland, U. S. A.

409,533. **Safety Tire Tube with Inner and Outer Flexible Annular Chambers Having a Common Base.** Wingfoot Corp., Wilmington, Del., assignee of C. H. Zimmerman, Akron, Ohio, both in the United States.

409,643. **Sponge Rubber Cushioning Material Having a Column-Like Structure of Thin Material of Open Network Made by Compacting into Sheet Form Loosely Intermingled Springy Upholstery Fibers Treated with Rubber Adhesive.** Dunlop Rubber Co., Ltd., London, assignee of S. D. Taylor, E. W. Madge, and E. A. Murphy, co-inventors, all of Birmingham, Warwickshire, both in England.

409,674. **Opposing Side Plates with a Rubber Cushioning therebetween Having a Single Tier of Supporting Ridge Portions Alternating from Side to Side, and Openings Opposite the Supporting Portions Alternating from Side to Side, Placing the Intervening Walls in Shear.** Lord Mfg. Co., assignee of G. H. Kaemmerling, both of Erie, Pennsylvania, U. S. A.

409,675. **Vibratory Body Subject to Torsional Vibrations, with a Mounting Link Having Its Ends Cushioned in Resilient Rubber.** Lord Mfg. Co., assignee of R. C. Henshaw, both of Erie, Pennsylvania, U. S. A.

409,692. **Spring Comprising Concentric Load Imposing and Load Supporting Members Separated by a Springing Means Composed of Elastic Plastic Material Stepped in a Radially Inward Direction from Its External Periphery and Being**

Adapted to Surface Contact Progressively the Steps of the Load Supporting Member under Increased Loading.

Transit Research Corp., assignee of E. H. Piron, both of New York, New York, U. S. A.

United Kingdom

549,007. **Rubber Joints.** T. Lord. Flexible Couplings or Links. T. B. Andre Rubber Co., Ltd., and R. D. French.

549,121. **Transfer for Printing on Rubber and Method of Application.** H. E. Peace & Co., Ltd., H. E. Peace, and W. Roberts.

549,269. **Electric Cables.** Callander's Cable & Construction Co., Ltd., P. V. Hunter, H. J. Alcock, and R. M. Fairfield.

549,400. **Apparatus to Prevent Accumulation of Ice.** B. F. Goodrich Co.

549,467. **Windshield Cleaner.** Trico Products Corp.

549,579. **Pneumatic Floats for Aircraft.** Wingfoot Corp.

549,598. **Resilient Supports or Mountings.** Rubber Bonders, Ltd., and C. Whittingham.

549,719. **Corsets, Etc.** E. H. P. M. Parsons, and C. F. Kempton.

549,896. **Rubber and Like Press Pads for Metal-Working Presses.** Wingfoot Corp.

549,902. **Hose Pipes Manufactured from Composite Rubber Fabrics.** M. Sabine.

549,904. **Tires.** Henley's Tire & Rubber Co., Ltd., and H. T. Stanley.

PROCESS

United States

2,304,210. **Manufacturing an Insulated Power Cable by Applying a Thin Layer of Conducting Rubber to the Surface of a Conductor, Applying a Layer of a Composite Tape Prepared by Rolling Together a Sheet of Insulating Rubber with a Sheet of Conducting Rubber on a Calender, Enclosing the Surface with a Layer of Insulating Rubber, and Applying a Layer of Composite Tape Having Its Non-Conducting Surface in Contact with the Insulating Rubber, and Vulcanizing the Assembly.** T. R. Scott, J. K. Webb, and J. F. Morley, London, England, assignors to International Standard Electric Corp., New York, New York, U. S. A.

2,304,554. **Separating Scrapped Vulcanized Rubber from the Fibrous Material in Tires.** L. Dixon, Akron, Ohio, assignor to B. F. Goodrich Co., New York, New York.

2,304,678. **Rubber Cement.** R. J. Bush, Wabash, Indiana, assignor to General Tire & Rubber Co., Akron, Ohio.

2,304,717. **Soft Porous Rubber Product Characterized by Having a Plurality of Fine Pores, a Liquid Immiscible with a Rubber Solvent Fixedly Disposed in the Pores to Prevent Substantial Shrinkage of the Rubber.** G. H. Swart, Wabash, Indiana, assignor to General Tire & Rubber Co., Akron, Ohio.

2,305,053. **Safety Tubes Having Inner and Outer Circumferential Chambers Separated by Diaphragm.** C. H. Zimmerman, Akron, Ohio, assignor to Wingfoot Corp., Wilmington, Delaware.

2,306,046. **Making a Composite Structure Highly Resistant to the Transmission of Water Vapor by Incorporating a Hydrocarbon Wax in a Vinyl Resin Composition and Adhering the Resin on a Sheet of Porous and Fibrous Material.** F. W. Duggan, Charleston, West Virginia, and F. Groff, Lakewood, Ohio, assignors to Carbide & Carbon Chemicals Corp., a corporation of New York, New York.

2,306,937. **Rubber Footwear with Surface Configurations.** A. L. Diller, Belmont, Massachusetts, assignor to B. F. Goodrich Co., New York, New York. 2,307,020. **Dispensing and Using a Flat Sheet of Rubber Deposited as a Thin Film on Paper.** Tearing the Paper, Stretching the Rubber to Remove the Rubber Gradually from the Torn Paper and Wrapping the Stretched Rubber, As It Is Removed, around an Article. L. G. Copeman, assignor to Copeman Laboratories Co., both of Flint, Michigan.

2,307,082. **Frothing Latex by Passing a Rubber Dispersion at a Controlled Rate into a Suitable Container, Passing a Gas through the Dispersion to Produce an Uncouagulated Froth, Passing the Froth and Excess Humid Gas in an Upward Direction through a Plurality of Small Orifices into a Mold and Curing the Rubber; the Gas Supply is Regulated So That a Dense Froth of Fine Pore Size Is Produced.** T. A. Te Grotenhuis, Olmsted Falls, Ohio.

Dominion of Canada

409,274. **Making a Braided Helically Coiled Cord by Unequally Tensioning the Strands of the Braid, Incorporating an Elastic Element in One Side of the Cord, and Causing the Cord to**

Twist between the Braiding Point and the Take-up Point.

Western Electric Co., Inc., New York, New York, assignee of W. T. Barrans, Townson, Maryland, both in the United States.

409,359. **Making a Floor Covering by Placing Woven Fabric in Surface to Surface Relation upon a Soft Felted Fibrous Base, Needling Portions of This Base through the Fabric, Calendering a Thin Layer of Unvulcanized Rubber on to the Fabric to Hold in Place the Portions Needled through the Fabric, Applying a Layer of Cement, Vibrating the Assembly, Cutting a Multitude of Coarse Pile Fiber Elements, and Directing Them Downwardly on to the Cement While the Assembly Is Being Vibrated So That They Will Bed Themselves, and Vulcanizing the Assembly.** National Automotive Fibers, Inc., Detroit, Michigan, assignee of H. P. Faris, Philadelphia, Pennsylvania, and D. W. Yochum and R. B. Logan, both of Trenton, New Jersey, co-inventors, all in the United States.

409,378. **Stenciling Mask Manufacture Employing Plastic Material in the Matrix to Provide a First Mold Member.** Sun Rubber Co., Barterton, Ohio, assignee of D. G. Rempel, Akron, Ohio, both in the United States.

409,385. **Sand Blasting Stencil.** Van Cleef Bros. (a partnership consisting of N. F. and P. Van Cleef), assignee of C. E. Frick, both of Chicago, Illinois, U. S. A.

409,532. **Method of Forming a Film Which Comprises Casting a Solution of a Film Forming Material Dissolved in a Solvent of the Class Consisting of Benzene and Ethylene Dichloride on to a Belt Having a Casting Surface Composed Essentially of Polyvinyl Alcohol, and Then after Evaporation of the Solvent, Stripping the Film from the Belt.** Wingfoot Corp., Wilmington, Delaware, assignee of A. M. Clifford, Stow, Ohio, both in the United States.

409,533. **Adding an Annular Band of Additional Road-Engaging Tread Material to a Pre-cured Tire Casing Which Has a Cured But Incomplete Crown Tread.** P. E. Hawkinson, Minneapolis, Minnesota, U. S. A.

409,652. **Leaf Assembly Having the Edges of the Leaves Interlocked by a Flexible and Elastic Adhesive.** Erie Foundry Co., assignee of L. F. Zahniser, both of Erie, Pennsylvania, U. S. A.

United Kingdom

549,282. **Patterned Minutely Perforated Rubber Sheet.** United States Rubber Co.

549,486. **Electrical Discharge Devices.** A. H. Stevens, (Firestone Tire & Rubber Co.).

549,615. **Impregnated Materials.** J. Burns, Ltd., British Rubber Producers' Research Association, and F. Din.

549,718. **Lam-Sheathed Cable Having a Covering of Vulcanizable Material.** Standard Telephones & Cables, Ltd.

CHEMICAL

United States

2,304,110. **Rutile Titanium Oxide Pigments.** R. M. McKinney, Roseelle, and H. M. Stark, Arden, assignors to E. I. du Pont de Nemours & Co., Wilmington, both in Delaware.

2,304,335. **Heat-Sensitizing Latex by Incorporating therein a Nitroparaffin Compound Which May Be Volatilized at Vulcanization Temperatures.** A. W. Campbell, assignor to Commercial Solvents Corp., both of Terre Haute, Indiana.

2,304,426. **Making a Di-(Arylene Thiiazyl) Disulfide.** R. L. Sibley, Nitro, West Virginia, assignor to Monsanto Chemical Co., St. Louis, Missouri.

2,304,466. **Stabilization of Vinyl Aromatic Resins.** L. A. Matheson, R. F. Boyer, and J. L. Amos, assignors to Dow Chemical Co., all of Midland, Michigan.

2,304,548-2,304,551. **Reclaiming Soft Vulcanized Rubber by Heating with Hydroxylamine or Its Salts Which Hydrolize to Form Free Hydroxylamine at a Temperature Not Lower Than 200° F. Until the Rubber Becomes Plastic.** P. J. Dasher, Akron, Ohio, assignor to B. F. Goodrich Co., New York, New York.

2,304,557. **Thiazyll Sulphur Halides.** W. H. Ebelke, Naugatuck, Connecticut, assignor to United States Rubber Co., New York, New York.

2,304,568. **Production of a Vulcanization Accelerator Which Comprises Reacting an Aqueous Solution of a Salt of a Mercapto-Aryl-Thiazole in the Cold with Chloramine Having the Formula NH-Cl. R. S. Hanslick, Nashville, Tennessee, assignor to United States Rubber Co., New York, New York.**

2,304,591. **Hermetically Sealed Flexible Cheese Package Having an Outer Layer of Metal Foil and an Inner Layer of Rubber Hydrochloride Material Heat Fused so That Any CO₂ Gas Evolved from the Cheese in the Curing thereof Distends the Walls of the Package and Is Ventilated through the Hydrochloride Layer.** C. B. Pape

and J. P. Langwill, Chicago, Ill., assignors to Reynolds Metals Co., Richmond, Va.

2,304,719. Titanium Dioxide Pigments. L. E. Weber and A. N. Copnall Bennett, Luton, England.

2,304,728. Stabilization of Polymerizable Vinyl Aromatic Compounds by Incorporating a Halo-Orth-Nitrophenol. R. F. Boyer and L. C. Rubens, assignors to Dow Chemical Co., all of Midland, Mich.

2,304,777. Non-Blooming Rubber Compound Having Incorporated therein a Pitch Residue Resulting from the Distillation of Water Gas Tar. T. A. Buhfiant, Hackensack, N. J., assignor, by mesne assignments, to Allied Chemical & Dye Corp., a corporation of N. Y.

2,304,800. Vulcanizing Rubber in the Presence of a Metal Dithiocarbamate. H. J. Cramer, Cuyahoga Falls, O., assignor to M. C. T. Corp., New York, N. Y.

2,304,858. Preparing a Continuous Strip of Coagulated Rubber by Mixing Latex with a Coalescence-Accelerator Which is a Soluble Salt of an Organic Acid Substantially Insoluble in Water, and Continuously Intermixing a Stream of the Treated Latex with a Stream of Dilute Acid Coagulant Sufficient to Bring the Mixture to pH Not over about 5. W. L. Stewart and E. B. Newton, both of Kuala Lumpur, F. M. S., assignors to B. F. Goodrich Co., New York, N. Y.

2,304,877. Synthetic Leather Compound Comprising Liquid Sodium Silicate and Rubber Dust in Approximately Equal Amounts. J. Birnbaum, New York, N. Y.

2,304,917. Polymerization of Vinyl Compounds with Acetylene Alcohols in the Presence of an Acetylene Alcohol Selected from the Class Consisting of Propargyl Alcohol, 1,4-Butine-Diol and Methyl Butinol as a Polymerization Accelerator. H. Hoff and C. W. Rautenstrauch, Ludwigshafen-on-the-Rhine, Germany, assignors, by mesne assignments, to General Aniline & Film Corp., New York, N. Y.

2,305,007. Interpolymerization Products of a Conjugated Butadiene and Aliphatic Monoolefins. H. Hoff and C. W. Rautenstrauch, both of Ludwigshafen-on-the-Rhine, Germany, assignors to Jasco, Inc., a corporation of Louisville, Ky.

2,305,025. Manufacture of Synthetic Rubber-Like Materials by Emulsion Polymerization of Butadiene-1,3 Hydrocarbons Using As Emulsifying Agents Water-Soluble Acid Addition Salts of Alkyl Amines Having a Straight Alkyl Chain of at Least 8 Carbon Atoms Directly Attached to the Nitrogen Atom. C. Mühlhausen, Leverkusen-I, G. Werk, and W. Becker, all of Cologne-Mülheim, Germany, assignors, by mesne assignments, to Jasco, Inc., a corporation of Louisville, Ky.

2,305,043. Soap Stabilized against Deterioration and the Development of Rancidity by Having Incorporated therein a Small Proportion of a Reaction Product of an Aliphatic Ketone with Ammonium Thiocyanate. W. P. ter Horst, Packanack Lake, N. J., assignor to United States Rubber Co., New York, N. Y.

2,305,164. Vulcanized Oil Composition Comprising a Vulcanizable Oil and Chloroprene Rubber Which Will Not React with a Vulcanizing Agent for the Oil. B. W. Hubbard, Oak Park, assignor to Ideal Roller & Mfg. Co., Chicago, both in Ill.

2,305,368. Removing Impurities from Titanium Dioxide Pigments. R. K. Whitten, assignor to E. I. du Pont de Nemours & Co., both of Wilmington, Del.

2,305,741. Conductive Shoe Bottom Filler Consisting of a Mixture of Dry Ground Cork in a Solution of the Chlorides of Sodium, Calcium, and Lithium. Conductive Rubber Cement Containing Carbon Black, and a Quantity of Benzol. A. Siers, assignor to O'Donnell Shoe Co., both of Humboldt, Tenn.

2,305,827. Laminated Glass, Utilizing a Polymerizable Ester of Vinyl Alcohol. A. Kampfer, Charlottenburg, Berlin, Germany; vested in the Alien Property Custodian.

2,305,859. Shaped Elastic Vinyl Resin Articles. E. Freund, New York, assignor to Gemloid Corp., Elmhurst, L. I., both in N. Y.

2,306,315. Mixed Ester of a Polyethylene Glycol Compatible with and Capable of Plasticizing Polyvinyl Acetal Resins. W. H. Lycan, Milwaukee, Wis., assignor to Pittsburgh Plate Glass Co., Allegheny County, Pa.

2,306,411. Diene Copolymers. F. K. Schoenfeld, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,306,478. Moistureproof Sheet Wrapping Material Having Incorporated in the Coating a Phenol-Modified Rubber. H. S. Holt, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,306,487. Removable and Reusable Adhesive Tape Having Incorporated in the Coating a Phenol-Modified Rubber Plasticized with Chlorinated Paraffin Wax. J. A. Mitchell, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

2,306,586. Polyvinyl Acetal Resin Condensation Product of a Hydrolyzed Polyvinyl Ester and an Aldehyde. K. G. Blaikie and R. N. Crozier, Shawinigan Falls, assignors to Shawin-

igan Chemicals, Ltd., Montreal, both in P. Q., Canada.

2,306,669. Vulcanization of Rubber in the Presence of a 2-Mercapto-Thiazoline and a Small Proportion of at Least One Aliphatic Monocarboxylic Acid. B. M. Sturgis, Pitman, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,306,731. Rubber Hydrochloride Composition Containing a Triaryl Stibine in a Small Amount Effective to Retard Photochemical Disintegration of the Rubber Hydrochloride and Each of the Aryl Groups Having a Carbon Directly Attached to the Antimony. G. E. Hulse, Passaic, N. J., assignor to United States Rubber Co., New York, N. Y.

2,306,779. Antioxidant Having Pyrrols, Oxazoles, or Piperidines Groups Attached to an Aliphatic Radical. C. Coleman, Montclair, N. J., assignor to United States Rubber Co., New York, N. Y.

2,306,790. Film Comprising Rubber Hydrochloride, Rubber Hydrobromide, or Rubber Hydroiodide. A. A. Heath, Hawthorne, Calif., U. S. A.

2,306,794. Coated Sheet Material of Vegetable Parchment Having a Bonding Layer Containing Rosin Size and a Thermoplastic Coating Layer of Paraffin-Wax and Pale Crepe Rubber. Marathon Paper Mills Co., Rothschild, assignee of A. Abrams, G. W. Forcey, and G. J. Brabender, all of Wausau, and W. H. Graebner, Neenah, co-inventors, all in Wis., U. S. A.

2,306,799. Film of Polyvinyl Alcohol Containing, as a Strip Agent, a Salt of a Fatty Acid Containing at Least 7 Carbon Atoms. F. M. Meigs, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,306,830. Antioxidant Comprising a Product of Thermal Reaction of a Ketone, an Aliphatic Hydrocarbon Alcohol, and a Secondary Di-Aromatic Amine in the Presence of an Acidic Catalyst with Elimination of Water. P. T. Paul, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,307,037. Plasticizing Synthetic Rubbers by Incorporating Prior to an Oxidizing Treatment an Unsaturated Drying Oil Fatty Acid. W. Gunzlich, Leverkusen-Schlebusch, and E. Konrad, Leverkusen-I, G. Werk, both in Germany, assignors, by mesne assignments, to Jasco, Inc., a corporation of La.

2,307,057. Transparent Flexible Moistureproof Film Comprising Wax, Chlorinated Rubber, Plasticizer, and a Transparentizing Halogenated Paraffin Wax. J. A. Mitchell, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,307,081. Manufacture of Rubber Hydrochloride Film Using More Wax Than Is Compatible with the Rubber Hydrochloride so That upon Evaporation of Solvent from the Cast Film of Cement thus Formed, a Coating of Wax Remains on the Surface. J. E. Snyder, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,307,090. Stabilizing Vinyl Resins by Adding an Organo-Metallic Lead Salt of an Aliphatic Carboxylic Acid Containing Not More Than 8 Carbon Atoms. V. Yingve, Lakewood, O., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,307,091. Vinyl Resin Molding Composition Having Retene as a Plasticizer. V. Yingve, Lakewood, O., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,307,092. Thermally Stable Vinyl Resin Composition Stabilized with an Organo-Metallic Salt of a Carboxylic Acid, the Vinyl Resin Having Halogen Attached to an Acyclic Carbon Atom. V. Yingve, Lakewood, O., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,307,461. Abrasive Article Comprising Abrasive Grains Bonded by a Protein and a Flexibility Extending Agent Consisting of Glycerine, Ethylene Glycol, Diethylene Glycol, Rubber, Castor Oil, Cotton Seed Oil, Sulphonated Castor Oil, and an Insolubilizing Agent for the Protein. D. O. Guth, St. Paul, Minn., assignor, by mesne assignments, to Minnesota Mining & Mfg. Co., a corporation of Del.

2,307,588. Insulated Electrical Conductor in Which the Insulation Comprises a Heat-Hardenable Phenol-Aldehyde-Modified Polyvinyl Resin Heated Treated in Place to Produce a Hard, Flexible, Tough, Abrasion-Resistant Insulation. E. H. Jackson and R. W. Hall, Fort Wayne, Ind., assignors to General Electric Co., a corporation of N. Y.

Dominion of Canada

408,980. Partially Hydrolyzing Polymerized Vinyl Acetate. Canadian Industries, Ltd., Montreal, P. Q., assignee of N. D. Scott, Sanborn, and J. E. Bristol, Niagara Falls, co-inventors, both in N. Y., U. S. A.

408,986. Rubber Vulcanization Accelerator Comprising a Zinc Salt of 2-Mercapto-Thiazoline. Canadian Industries, Ltd., Montreal, P. Q., assignee of L. Williams, Borger, Tex., and B. M. Sturgis, Pitman, N. J., co-inventors, both in the U. S. A.

408,989. Rubber Vulcanization Accelerator Comprising a Metal Salt of 2-Mercapto-Thiazoline in Which Each Organic Group Attached to the Metal is a 2-Mercapto-Thiazoline Group. Canadian Industries, Ltd., Montreal, P. Q., assignee of L. Williams, Borger, Tex., and B. M. Sturgis, Pitman, N. J., co-inventors, both in the U. S. A.

409,038. Interleaf Material for Laminated Safety Glass Which Comprises a Polyvinyl Acetal Resin Plasticized with a Mixed Molecule Ester of a Polyvinyl Alcohol. Monsanto Chemical Co.,

St. Louis, Mo., assignee of Fiberloid Corp., Indian Orchard, assignee of J. M. DeBell, Longmeadow, and E. R. Derby, Springfield, co-inventors, all in Mass., both in the U. S. A.

409,045. Magnesium Carbonate Composition. Plant Rubber & Asbestos Works, assignee of S. A. Abrahams, both of San Francisco, R. Lewon, Menlo Park, and L. L. Collonge, Palo Alto, co-inventors, all in Calif., U. S. A.

409,046 and 409,047. Magnesium Carbonate Composition. Plant Rubber & Asbestos Works, assignee of S. A. Abrahams, both of San Francisco, and R. Lewon, Menlo Park, co-inventors, both in Calif., U. S. A.

409,099. Stencil Sheet Coated with a Tenuous Film Comprising Rubber Hydrochloride, Rubber Hydrobromide, or Rubber Hydroiodide. A. A. Heath, Hawthorne, Calif., U. S. A.

409,227. Coated Sheet Material of Vegetable Parchment Having a Bonding Layer Containing Rosin Size and a Thermoplastic Coating Layer of Paraffin-Wax and Pale Crepe Rubber. Marathon Paper Mills Co., Rothschild, assignee of A. Abrams, G. W. Forcey, and G. J. Brabender, all of Wausau, and W. H. Graebner, Neenah, co-inventors, all in Wis., U. S. A.

409,251. Golf Ball Cover Consisting of a Mixture of Pigments, Hard Thermoprene Formed by Reacting Rubber with a Sulphur-Containing Acid, and a Rubbery Material Consisting of Rubber, a Blend of Polyisobutylene and Rubber, or a Blend of Glue and Rubber; the Ball Cover Is of Good Click Characteristics, Resistant to Cutting and Cracking during Normal Use, and of Good Putting Characteristics. A. G. Spalding & Bros. of Canada, Ltd., Brantford, Ont., assignee of J. B. Dickson, Northampton, and R. A. Stafford, Chicopee, co-inventors, both in Mass., U. S. A.

409,332. 1,1'-Dithio Bis Arylenethiazole Manufacture. Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. E. Messer, Cheshire, Conn., U. S. A.

409,439. Electrical Conductor Provided with a High Dielectric Strength, Heat, Oil-, and Moisture-Resistant, Flexible Coating Which Is the Residue of Heating a Composition Comprising Polymerized Acrylonitrile to Incipient Decomposition. Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. Pohler, Berlin-Schöneberg, Germany.

409,335. Lacquering Rubber by Coating It with Lacquer and Conjointly Baking the Lacquer and Vulcanizing the Rubber, Which Has Incorporated therein Substantial Quantities of Sulphur and Rubber Vulcanization Accelerator. Dominion Rubber Co., Ltd., Montreal, P. O., assignee of P. L. Bush and D. E. Lovell, co-inventors, both of Mishawaka, Ind., U. S. A.

409,334. Manufacture of 1,1'-Dithio Bis Arylenethiazoles. Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. E. Messer, Cheshire, Conn., U. S. A.

409,395. Tire Cord Fabric Composed of Warp Material Which Does Not Become Ineffective at Vulcanization Temperatures and a Weft of Yarns Which Comprise Fusible Polyvinyl Resin That Becomes Ineffective at Vulcanization Temperatures. C. Dreyfus, New York, N. Y., assignee of G. Schneider, Montclair, N. J., both in the U. S. A.

409,459. Polyvinyl Acetal Resin. Canadian Kodak Co., Ltd., Toronto, Ont., assignee of G. B. Bachman, Rochester, N. Y., U. S. A.

409,460. Polyvinyl Acetal Resin. Canadian Kodak Co., Ltd., Toronto, Ont., assignee of M. Salo, Rochester, N. Y., U. S. A.

409,461 and 409,462. Polyvinyl Acetal Resin. Canadian Kodak Co., Ltd., Toronto, Ont., assignee of D. R. Swan, Rochester, N. Y., U. S. A.

409,463. Polyvinyl Acetal Resin. Canadian Kodak Co., Ltd., Toronto, Ont., assignee of C. R. Fordyce, Rochester, N. Y., U. S. A.

409,466. Coating Process and Composition Utilizing a Dispersion of a Vinyl Resin Resulting from the Conjoint Polymerization of Vinyl Chloride with a Vinyl Ester of an Aliphatic Acid, Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of C. W. Patton, Pittsburgh, Pa., U. S. A.

409,651. Leaf Assembly Having the Edges of the Leaves United by an Adhesive Consisting Mainly of Reclaimed Rubber, Resin, a Hydrocarbon, and a Hydrophilic Solvent to Permit the Presence of Water. Erie Foundry Co., assignee of L. F. Zahmiser, both of Erie, Pa., and J. O. Small, Cleveland Heights, O., co-inventors, both in the U. S. A.

United Kingdom

549,162. Treatment of Latex, and Resultant Product. United States Rubber Co.

549,303. Oil-Soluble Polystyrene Resinous Products. Bakelite, Ltd.

549,515. Synthetic Resins from Furfuryl Alcohol. British Thomson-Houston Co., Ltd.

549,800. Processes and Materials for Thickening Latex, Etc. Advance Solvents & Chemical Corp.

549,895. Treatment of Vulcanized Rubber Articles and Products Obtained thereby. United States Rubber Co.

(Continued on page 518)

WAX FINISHES FOR RUBBER GOODS!

Easy to apply, water-repellent, non-flammable, Johnson's Wax Finishes are valuable allies for the manufacturer of rubber goods. They retard oxidation, the destroyer of rubber, and add a lustre which improves the appearance of the finished products.

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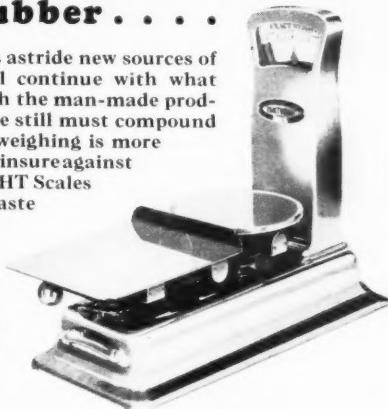
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Market Reviews

RECLAIMED RUBBER

PRODUCTION of reclaim continues at a high level, with demand exceeding supply. Results of the survey conducted by the Office of the Rubber Director to determine ways and means of increasing reclaim production by 20% have not been announced; but if the synthetic production does not come in according to schedule, the emphasis on increased reclaim production will become much greater. On December 31 it was announced that OPA Revised Price Schedule No. 56, Amendment No. 2, effective January 6, 1943, would apply to all sales of reclaimed rubber except reclaimed rubber made from scrap rubber products containing synthetic rubber. Previously this Price Schedule had applied only to sales of red-tube reclaim. Reclaimed synthetic rubber has been excluded from Schedule 56 in order to facilitate development of the industry. Prices of the various grades of regular reclaimed rubber are not affected, since the amendment provides the ceilings already established under the supplanted regulations are to continue for the items brought under Schedule 56. Ceiling prices on selected grades are listed below:

Ceiling Prices

Auto Tire	Sp. Grav.	per Lb.
Black Select.....	1.16-1.18	6 ¹ / ₂ / 6 ³ / ₄
Acid.....	1.18-1.22	7 ¹ / ₂ / 7 ³ / ₄

Shoe

Standard.....	1.56-1.60	7 / 7 ¹ / ₂
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Tubes

Black.....	1.14-1.26	11 ¹ / ₂ / 11 ¹ / ₂
Gray.....	1.15-1.26	12 ¹ / ₂ / 13 ¹ / ₂
Red.....	1.15-1.32	12 / 12 ¹ / ₂

Miscellaneous

Mechanical blends.....	1.25-1.50	4 ¹ / ₂ / 5 ¹ / ₂
White.....	1.35-1.50	13 ¹ / ₂ / 14 ¹ / ₂

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclains in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Fixed Government Prices

Balata	Price per Lb.
Prime Manaos Black	\$0.68 ¹ / ₂
Surinam Sheet.....	.64

Guayule.....	.17 ¹ / ₂
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Plantation Grades*

No. 1-X R.S.S. in Cases.....	.22 ¹ / ₂
No. 1 Thin Latex Crepe.....	.23%
No. 2 Thick Latex Crepe.....	.23%
No. 1 Brown Crepe.....	.21%
No. 2 Brown Crepe.....	.21%
No. 2 Amber.....	.21%
No. 3 Amber.....	.21%
Rolled Brown.....	.17 ¹ / ₂

Synthetic Rubber

GR-S (Buna S)50
GR-M (Neoprene GN)65

*For a complete list of government prices see our June, 1942, issue, p. 254.

†For complete list see December, 1942, p. 297.

Rims Approved and Branded by The Tire & Rim Association

Rim Size	Dec., 1942
15" & 16" D. C. Passenger	9,651
16x4.00E	818
16x4.25E	295
16x4.50E	2,773
16x5.00F	
17" & over D. C. Passenger	5,966
18x2.15B	
Military	
16x4.50CE	109,479
16x6.50CS	56,347
18x8.00CV	1,696
20x4.50CR	3,328
20x6.00CT	25,114
20x10.00CW	2,694
24x10.00CW	849
Flat Base Truck	
17x4.33R (6")	1,815
20x4.33R (6")	1,604
18x5.00S (7")	1,802
20x5.00S (7")	259,765
15x6.00T (8")	4,308
20x6.00T (8")	25,525
22x6.00T (8")	14
15x7.33V (10")	250
20x7.33V (10")	24,517
22x7.33V (10")	1,560
24x7.33V (10")	1,106
20x8.37V (11")	1,169
Tractor & Implement	
16x3.00D	856
18x5.50F	9,821
20x8.00T	569
24x8.00T	278
28x8.00T	197
32x8.00T	92
Cast	
24x15.00	55
TOTAL	554,313

MACHINERY

(Continued from page 516)

United States

2,304,199. Appliance for Molding Hollow Rubber Balls, Etc. A. E. P. Milner, Melbourne, Victoria, Australia.
2,304,575. Footwear-Pressing Apparatus. S. D. Klyve, Lexington, Mass., assignor to B. F. Goodrich Co., New York, N. Y.
2,305,412. Heat and Sulphur Resistant Tire Curing Bag. P. K. Frolich, Westfield, N. J., and H. D. Hineline, Mount Vernon, N. Y., assignors, by mesne assignments, to Jasco, Inc., a corporation of La.
2,305,853. Apparatus for Fabricating Flexible Puncture-Sealing Sheet Material. E. Eger, Grosse Pointe Park, and H. A. Wright, Detroit, both in Mich., assignors to United States Rubber Co., New York, N. Y.
2,306,243. Apparatus and Method for Making Fluid Filled Golf Ball Cores. T. S. Black, Johnston, R. I., assignor to United States Rubber Co., New York, N. Y.
2,306,530. Heel Nailing Machine. C. M. De Wolfe, Somerville, Mass., assignor to B. F. Goodrich Co., New York, N. Y.

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Where the middleman serves a

VITAL PURPOSE

From the rubber scrap in the salvage yard to the finished reclaim ready for use is a long road, for that scrap must be assembled, carefully sorted by experts, and then delivered to the reclaimers for processing. It requires training and organization to prevent waste and speed up the work.

That is why we are proud that our experience and organization are being used between the scrap pile and the reclaimer—working under the direct control and supervision of the Rubber Reserve Company for the period of the emergency.

THE LOEWENTHAL CO.

Buying Agent, Rubber Reserve Company

188 W. RANDOLPH ST.

159 CLEWELL ST.

CHICAGO, ILL.

AKRON, OHIO

Serving the Trade Since 1868

COMPOUNDING INGREDIENTS

TONE of the compounding ingredients market was generally quiet during January. Chemicals necessary in the processing of synthetic rubber have not begun to move in greater quantities as yet as manufacturers await the requirements of the advancing synthetic rubber program. Almost all prices remain unchanged.

ALCOHOL. Expansion of production facilities is not progressing fast enough to take care of war requirements and only delay in rubber program eases the situation at this time, with a rise in consumption due later on.

CARBON BLACK. Improved buying interest is noted as consumers stock up for GR-S production which is expected to reach a production point of significance later in the year.

CLAY. Shipments are low and use in synthetic rubber has not yet been clarified.

COLORS. Organic dyestuffs were cut to 40% below the 1941 figures in an amendment to WPB Conservation Order M-103, retroactive to January 1.

RUBBER SUBSTITUTES. Favorable action by OPA is anticipated in the near future on the industry's request for higher ceiling prices, considered necessary because of recent increases in ceilings on certain vegetable oils. Demand for this important compounding component in the synthetic rubber program continues heavy.

SOLVENTS. General Preference Order M-41 as Amended January 9, 1943, provides for restrictions on deliveries of chlorinated hydrocarbon solvents to persons with a B-2 preference rating as designated in the Order.

ZINC OXIDE. Demand is expected to remain on an even keel for the next few months. Rubber reclaimers are entering the market for American-process oxides.

Current Quotations*

Abrasives

Pumicestone, powdered.....	lb. \$0.035	/ \$0.04
Rothstone, domestic.....	lb. .025	

Accelerators, Inorganic

Lime, hydrated, <i>L.c.L.</i> , New York.....	ton 25.00	
Litharge (commercial).....	lb. .09	
Magnesia, calcined, heavy.....	lb. .09	

technical, light.....

..... lb. .0625 / .07

Accelerators, Organic

A-1.....	lb. .28	/ .33
A-10.....	lb. .36	/ .42
A-19.....	lb. .52	/ .65
A-32.....	lb. .60	/ .70
A-46.....	lb. .50	/ .57
A-77.....	lb. .42	/ .55
A-100.....	lb. .42	/ .55
Accelerator 49-808.....	lb. .40	/ .42
833.....	lb. .59	/ .61
Acrin.....	lb. .65	
Aldehyde ammonia.....	lb. .65	/ .70
Altax.....	lb. .43	/ .45
Arazeate.....	lb. 1.53	
B-J-F.....	lb. .38	/ .43
Beutene.....	lb. .50	/ .64
Butasan.....	lb. 1.15	
Butazate.....	lb. 1.13	
Butyl Eight.....	lb. .97	/ .99
C-P-B.....	lb. 1.95	
Captax.....	lb. .38	/ .40
D-B-A.....	lb. 1.95	

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed, and those readers interested should contact suppliers for spot prices.

Delac A.....	lb. \$0.39	\$0.48
O.....	lb. .39	.48
P.....	lb. .39	.48
Di-Esterex-N.....	lb. .50	.57
DOTG (Di-orthotolyl guanidine).....	lb. .44	.46
DPG (Diphenylguanidine).....	lb. .35	.36
El-Sixty.....	lb. .40	/ .47
Ethasan.....	lb. 1.13	
Ethazate.....	lb. 1.13	
Ethylenediamine.....	lb. .42	/ .43
Formaldehyde-P.A.C.....	lb. .06	/ .0625
Formaldehyde-para-toluidine.....	lb. .63	.65
Formalin.....	lb. .36	/ .37
Guantal.....	lb. .39	.48
Heptene.....	lb. .34	/ .39
Base.....	lb. 1.25	/ 1.40
Hexamethylenetetramine U.S.P.....	lb. .39	
Technical.....	lb. .33	
Lead oleate, No. 990.....	lb. .175	
Witco.....	lb. .15	
Lefade.....	lb. 1.48	
M-B-T.....	lb. .38	/ .40
M-B-T-S.....	lb. .43	/ .45
Methasan.....	lb. 1.23	
Methazate.....	lb. 1.23	
Monex.....	lb. 1.53	
Morfex "33" "55".....	lb. .67	/ .72
O-X-A-F.....	lb. .96	/ 1.01
Oxynone.....	lb. .38	/ .43
Penta-nitro-dimethylamine.....	lb. .85	
Pentex.....	lb. .74	/ .83
Flour O.....	lb. .1225	/ .1325
Phenex.....	lb. .49	/ .54
Pipazate.....	lb. 1.53	
Pip-Pip.....	lb. 1.63	
R & H 50-D.....	lb. .42	/ .43
Rotax.....	lb. .48	/ .50
Safex.....	lb. 1.15	/ 1.25
Santocure.....	lb. .60	/ .67
Selenate.....	lb. 1.98	
SPDX-A.....	lb. .69	/ .74
Super sulphur No. 2.....	lb. .13	/ .15
Tetrone A.....	lb. 2.20	
Thiocarbanilide.....	lb. .28	/ .33
Thiofide.....	lb. .43	/ .50
Thionex.....	lb. 1.53	
Thiotax.....	lb. .38	/ .45
Thiurad.....	lb. 1.53	
Thiuram E-M.....	lb. .69	/ .74
Trimene.....	lb. .54	/ .64
Base.....	lb. 1.03	/ 1.18
Triphenylguanidine (TPG) Tuads, Methyl.....	lb. .45	
Tnex.....	ton 1.53	
2-MT-Uto.....	lb. .58	/ .60
Uto.....	lb. .99	/ 1.04
Ureka.....	lb. .50	/ .57
Blend B-C.....	lb. .50	/ .57
Vulcanex.....	lb. .48	/ .55
Z-B-X.....	lb. 2.45	
Zenite-A-B.....	lb. .40	/ .42
Zinante, Butyl-Ethyl-Methyl.....	lb. 1.13	
Zipacel.....	lb. 1.23	

Activators		
Aero Ac 50.....	lb. .46	/ .52
Barak.....	lb. .50	
MODX.....	lb. .295	/ .345
SL-20.....	lb. 1.089	/ .1135

Age Resistors

AgeRite Alba Gel.....	lb. 1.95	/ 2.05
Hipar Powder.....	lb. .61	.63
Resin D.....	lb. .43	.45
White Akroflex C-Albasan.....	lb. 1.23	/ 1.33
Aminox.....	lb. .69	.74
Antox.....	lb. .45	.52
Betanol.....	lb. .54	.56
B-L-E Powder.....	lb. .43	.52
B-X-A Copper Inhibitor N-872-A.....	lb. .61	.70
Fleet of H White.....	lb. .43	/ .50
M-U-F Neozone (standard).....	lb. 1.15	
A.....	lb. .43	/ .45
C.....	lb. .43	/ .55
D.....	lb. .43	/ .45
Distilled.....	lb. .48	.50
E.....	lb. .61	.63
Oxynone.....	lb. .77	/ .90
Permalux.....	lb. 1.18	1.20
Santoflex B-BX.....	lb. .43	.50
Santovar A.....	lb. 1.15	/ 1.40
Stabilite Alba.....	lb. .48	.69
	lb. .50	/ .74

Thermoflex A.....	lb. \$0.61	/ \$0.63
C.....	lb. .54	.56
Tysontite.....	lb. .16	/ .165
V-G-B.....	lb. .43	.52

Alkalies

Caustic soda, flake, Columbia (400-lb. drums).....	100 lbs.	2.70 / 3.55
Liquid, 50%.....	100 lbs.	1.95
Solid (700-lb. drums).....	100 lbs.	2.30 / 3.15

Antiscorch Materials

Antiscorch T.....	lb. .90	
Cumar RH.....	lb. .105	
E-S-E-N.....	lb. .34	/ .39
R-17 Resin (drums).....	lb. .1075	
RM.....	lb. .125	
Retarder W.....	lb. .36	
Retardex U-T-B.....	lb. .445	/ .475
U-T-B.....	lb. .34	/ .39

Antisun Materials

Helizone.....	lb. .23	/ .24
S.C.R.....	lb. .32	/ .34
Suproof Jr.....	lb. .2275	/ .2775
Unicel.....	lb. .165	/ .215

Brake Lining Saturant

B.R.T. No. 3.....	lb. .0175	/ .0185
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Colors

Black Du Pont powder.....	lb. .42	
Lampblack (commercial), <i>L.c.L.</i> lb.	lb. .15	

Blue

Blue Du Pont Dispersed.....	lb. .35	/ .95
Powders.....	lb. 2.25	/ 3.75
Heligen BKA Toners.....	lb. .10	

Brown

Mapico.....	lb. .1135	
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Green

Chrome Oxide (<i>freight allowed</i>).....	lb. .25	
Du Pont Dispersed Powders.....	lb. .98	/ 2.85
Toners.....	lb. .70	

Orange

Orange Du Pont Dispersed Powders.....	lb. .88	/ 2.35
Toners.....	lb. 2.75	/ 3.05

Orchid

Toners.....	lb. .10	
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Pink

Toners.....	lb. .10	
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Purple

Toners.....	lb. .10	
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Red

Antimony Crimson, 15/17%.....	lb. .48	
R. M. P. No. 3.....	lb. .52	
Sulphur free R.M.P. Golden 15/17%.....	lb. .37	
Golden 15/17% Z-2.....	lb. .25	
Cadmium light (400-lb. bbls.).....	lb. .85	/ .90
Du Pont Dispersed Powders.....	lb. .93	/ 2.05
Iron Oxide, <i>L.c.L.</i>	lb. .0625	.15
Mapico Rub-Er-Red (bbls.).....	lb. .0975	
Toners.....	lb. .0975	

White

White Lithopone (bags).....	lb. .0425	.0445
Albath.....	lb. .0425	.0445
Astrolith (50-lb. bags).....	lb. .0425	.0445
Azolith.....	lb. .0425	.0445

Titanium Pigments

Titanium Pigments Ray-bar.....	lb. .055	/ .065
Ray-cal.....	lb. .0525	.0625
Rayox.....	lb. .135	.165
Titanolith (50-lb. bags).....	lb. .056	.0585
Titanox-A B.....	lb. .145	.175
Titanox-A 30.....	lb. .0575	.0625
C.....	lb. .055	.06
RC.....	lb. .055	.06
RC-HT.....	lb. .055	.06
Ti-Tone.....	lb. .055	.06

Zinc Oxide Zppoque (50-lb. bags).....

Zinc Oxide Zppoque (50-lb. bags).....	lb. .145	/ .1525
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Zinc Oxide Azo ZZZ-11.....

Zinc Oxide Azo ZZZ-11.....	lb. .0725	.0
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Horse Head Special 3	.lb.	\$0.0725 / \$0.075
XX Red-4	.lb.	.0725 / .075
23	.lb.	.0725 / .075
72	.lb.	.0725 / .075
78	.lb.	.0725 / .075
80	.lb.	.0725 / .075
103	.lb.	.0725 / .075
110	.lb.	.0725 / .075
St. Joe (lead tree)		
Black Label	.lb.	.0725 / .075
Green Label	.lb.	.0725 / .075
Red Label	.lb.	.0725 / .075
U.S.P.	.lb.	.105 / .1075
Zinc Sulfide Pigments		
Cryptone-BA-19	.lb.	.056 / .0585
BT	.lb.	.056 / .0585
CB	.lb.	.056 / .0585
MS	.lb.	.0575 / .06
ZS No. 20	.lb.	.0825 / .085
86	.lb.	.0825 / .085
230	.lb.	.0825 / .085
800	.lb.	.0825 / .085
Sunolith	.lb.	.0425 / .045
Yellow		
Cadmolith (cadmium yellow), (400-lb. bbls.)	.lb.	.60 / .65
Du Pont Dispersed Powders	.lb.	1.25 / 1.85
Mapico	.lb.	.70 / 1.75
Toners	.lb.	.071
Dispersing Agents		
Bardex	.lb.	.0425 / .045
Bardol	.lb.	.025 / .0275
B.	.lb.	.05 / .0525
Darvan No. 1	.lb.	.30 / .34
2	.lb.	.30 / .34
3	.lb.	.30 / .34
Nevol (drums, c.t.)	.lb.	.02 / .025
Santomerse S.	.lb.	.11 / .25
Extenders		
Extendex C	.lb.	
Naftolen	.lb.	.15 / .20
"600" S.	.lb.	.14 / .16
Vanzak	.gal.	.05 / .06
Fillers, Inert		
Asbestine, c.t.	.ton	20.00
Asbestos Fiber	.ton	15.50 / 48.00
Barytes	.ton	40.00
f.o.b. St. Louis (50-lb. paper bags)	.ton	25.55
Off color, domestic	.ton	29.00
White, domestic	.ton	38.50
Blanc fixe dry, precip.	.ton	80.00
Calcene	.ton	37.50 / 43.00
Infusorial earth	.lb.	.0225
Kalite No. 1	.ton	26.00
3	.ton	36.00
Kalvan	.ton	100.00
Magnesium Carbonate, l.c.l.	.lb.	.0725
Paradene No. 2 (drums)	.lb.	.0525
Pyrax A.	.ton	7.50
Whiting		
Columbia Filler	.ton	9.00 / 14.00
Suprex White	.ton	32.50
Witco, c.t.	.ton	8.00
Witcarb	.lb.	
Finishes		
Black-Out (surface protec- tive)	.gal.	4.50 / 5.00
Mica, l.c.l.	.ton	20. / 52.
Rubber lacquer, clear	.gal.	1.00 / 2.00
Colored	.gal.	2.00 / 3.50
Shoe varnish	.gal.	1.45
Talc	.ton	25.00
Flock		
Cotton flock, dark	.lb.	.09 / .10
Dyed	.lb.	.40 / .80
White	.lb.	.12 / .18
Rayon flock, colored	.lb.	1.00 / 1.50
White	.lb.	.75 / 1.00
Latex Compounding Ingredients		
Accelerator 552	.lb.	1.63
Aerosol OT Aqueous 25%	.lb.	.30
Antoks, dispersed	.lb.	.54
Aquarex D.	.lb.	.75
F.	.lb.	.85
MDI Paste	.lb.	.25
Areskap No. 50	.lb.	.18 / .24
100, dry	.lb.	.39 / .51
Aresket No. 240	.lb.	.16 / .22
300, dry	.lb.	.42 / .50
Areskrene No. 375	.lb.	.35 / .50
400, dry	.lb.	.51 / .65
Black No. 25, dispersed	.lb.	.22 / .40
Casein, muriatic 30 mesh	.lb.	.21
Collocarb.	.lb.	.07
Color Pastes, dispersed	.lb.	.75 / 1.10
Copper Inhibitor X-872	.lb.	.225
Disperxes No. 15	.lb.	.11 / .12
No. 20	.lb.	.08 / .10
Factex Dispersion A	.lb.	.17
Heliozone, dispersed	.lb.	.25
MICRONEX, Colloidal	.lb.	.06
R-2 Crystals	.lb.	1.55
S-1 (400-lb. drams)	.lb.	.65
Santomerse Briquettes	.lb.	
Powder	.lb.	
Santomerse D.	.lb.	.41 / .65
S.	.lb.	.11 / .25
Sodium Stearate	.lb.	.40
Stablex A	.lb.	.90 / 1.10
B.	.lb.	.70 / .95
C.	.lb.	.40 / .50
Reodrants		
Amora A	.lb.	
B.	.lb.	
C.	.lb.	
D.	.lb.	
Sulphur, dispersed	.lb.	\$0.10 / \$0.15
No. 2	.lb.	.08 / .12
T-1 (440-lb. drums)	.lb.	.40
Teipidone	.lb.	.63
Tetronne A	.lb.	2.20
Tysonite, dispersed	.lb.	.32 / .35
Zenite Special	.lb.	.47
Zinc oxide, dispersed	.lb.	.12 / .15
Mineral Rubber		
Black Diamond, l.c.l.	.ton	25.00 / 30.00
B.R.C. No. 20	.lb.	.0105 / .0115
Hydrocarbon, Hard	.ton	25.00 / 27.00
MillMar	.lb.	.055
Parmar	.ton	
Pioneer, c.t.	.ton	25.00 / 27.00
285°-300°	.ton	25.00 / 27.00
Mold Lubricants		
Aluminum Stearate	.lb.	.23 / .24
Aquarex D.	.lb.	.75
MDL Paste	.lb.	.25
Colite	.gal.	.90 / 1.15
Lubres	.lb.	.25 / .30
Mold Paste	.lb.	.12 / .30
Rubber-Glo, conc. regular, Type W	.gal.	.94 / 1.15
Sericite	.ton	65.00
Soapstone, l.c.l.	.ton	22.60
Zinc Stearate	.lb.	.30 / .31
Oil Resistant		
A-X-F	.lb.	.82 / .85
Reclaiming Oils		
B.R.V.	.lb.	.035 / .0375
C-10	.gal.	.19 / .24
D-4	.gal.	.17 / .22
E-5	.gal.	.15 / .20
No. 1621	.lb.	.021 / .0235
S.R.O.	.lb.	.02 / .0225
X-60 (reclaiming)	.gal.	.20 / .27
X-443	.gal.	.29
Reenforcers		
Carbon Black		
Aerfloted Arrow Specifica- tion (bags only)	.lb.	.0355†
Arrow Compact Granu- lized	.lb.	.0355†
Certified Heavy Com- pressed (bags only)	.lb.	.0355†
SPHERON	.lb.	.0355†
Channel "S"	.lb.	.12
Continental, dustless	.lb.	.0355†
"AA"	.lb.	
Compressed (bags only)	.lb.	.0355†
Disperso	.lb.	.0355†
Dixie	.lb.	.0355†
Dixedensed	.lb.	.0355†
66	.lb.	.0355†
Furnex	.lb.	.035
Beads	.lb.	.035
Gastex	.lb.	.035 / .06
HX	.lb.	.0355†
Kosmobile	.lb.	.0355†
66	.lb.	.0355†
77	.lb.	.0355†
S.	.lb.	.0355†
Kosmos	.lb.	.0355†
Dixie 20	.lb.	.035†
MICRONEX Beads	.lb.	.0355†
Hi-Tear	.lb.	.0355
Mark II	.lb.	.0355
Standard	.lb.	.0355
W-5	.lb.	.0355
W-6	.lb.	.0355
P-33	.lb.	.0475
Pelletex	.lb.	.035 / .06
SPHERON "C" (bags)	.lb.	.0455†
"N" (bags)	.lb.	.15
T (bags)	.lb.	.09
Statex	.lb.	
Thermax	.lb.	.0225
"S"	.lb.	.0675
TX	.lb.	.0355†
Velvetex	.lb.	
"WYEX BLACK"	.lb.	.0355†
Carbonex Flakes	.lb.	.03 / .035
S.	.lb.	.031 / .036
Plastic	.lb.	.031 / .0335
Clays		
Aerfloted Hi-White	.ton	10.00
L.G.B.	.ton	15.00
Paragon (50-lb. bags)	.ton	10.00
Smur (50-lb. bags)	.ton	10.00 / 23.50
Calpalco, c.t.	.ton	30.00
China	.ton	25.00
Dixie	.ton	10.00 / 22.50
"L"	.ton	10.00
Langford	.ton	8.50
McNamee	.ton	10.00
Par	.ton	10.00
Paraforce, c.t.	.ton	50.00
Witco, c.t.	.ton	10.00
Cumar EX	.lb.	.05
MH	.lb.	.065 / .115
V	.lb.	.095 / .125
465 Resin	.lb.	
"G" Resin	.lb.	
Nevindene	.lb.	
Silene	.lb.	.04 / .045
Solvents		
Beta-Trichloroethane	.lb.	.20
Carbon Bisulphide	.ton	5.75
Tetrachloride	.gal.	.80
Cosol No. 1	.gal.	.26
No. 2	.gal.	.25
No. 3	.gal.	.22
Industrial 90% benzol (tank car)	.gal.	.15 / .22
Nevol	.gal.	.245 / .31
Pico	.gal.	.22 / .32
Skellysolve	.gal.	
Stabilizers for Cure		
Barium Stearate	.lb.	.29 / .32
Calcium Stearate	.lb.	.26 / .27
Laurex (bags)	.lb.	.1475 / .1725
Lead Stearate	.lb.	
Magnesium Stearate	.lb.	.31 / .32
Stearex B.	.lb.	.1325 / .1425
Beads	.lb.	.1325 / .1425
Stearic acid, single pressed	.lb.	.1325 / .1425
Stearite, c.t.	.lb.	.1325
Zinc Laurate	.lb.	.29 / .32
Stearate	.lb.	.31 / .31
Synthetic Rubber		
Agripol Solids, l.c.t.	.lb.	.44 / .54
Solutions, l.c.t.	.lb.	.23 / .295
Hycar OR-15	.lb.	.70
OS-10	.lb.	.70
Neoprene Latex Type 571	.lb.	.30
60	.lb.	.36
Neoprene Type CG	.lb.	.70
E	.lb.	.65
ER	.lb.	.75

Neoprene G.	lb. \$0.70
GN	lb. .65
ILS	lb. .70
KNR	lb. .75
M	lb. .65
Synthetic 100	lb. .45
"Thiokol" Type "A"	lb. .35
"EA"	lb. .50
"RD"	lb. .70
Molding powder	lb. .61
Tackifiers	
B.R.H. No. 2	lb. .02 /\$0.021
LX-433 (tank car)	lb. .068
P.H.O. (drums)	lb. .24

Vulcanizing Ingredients

Magnesia, light (for neoprene)	lb. \$0.25
Sulphur	100 lbs. 2.05
Chloride (drums)	lb. .04
Telloy	lb. 1.75
Thiogen 6	lb. .18 /\$0.25
10	lb. .18 /\$0.25
Vandex	lb. 1.75

(See also Colors—Antimony)

Waxes

736 (clear)	gal. \$1.25
1515-A (black)	gal. 1.35
Carnauba, No. 3 chalky	lb.
2 N.C.	lb.
3 N.C.	lb.
1 Yellow	lb. .8325
2	lb. .8125
Carnauber	lb. .49 /\$0.59
Monten	lb. .12 /.17
Rubber Wax No. 118,	
Neutral	gal. .76 /.31
Colors	gal. .86 /.41

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- YOUR CHANCES FOR TIRES IN 1943. W. M. Jeffers, *American Magazine*, Feb., 1942, pp. 20-21.
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AFRICA

A review of the work being carried out in South Africa to find and exploit indigenous rubber-bearing plants was recently issued by the Controller of Rubber. The chief local rubber-bearing plants are the *landolphia* vines and different varieties of *Euphorbia*. The *landolphia* is found growing over a large part of southern and central Africa, from the dense forests of North Zululand through Mozambique up into central Africa. The rubber is said to be of good quality, but it is not easy to collect as the regions where the vine grows are generally not readily accessible and are also unhealthy.

Of the *Euphorbia*, about 120 different varieties exist; different types yield varying amounts of rubber, and all have a considerable resin content which must be removed if the rubber is to be useful. Three varieties of *Euphorbia* in addition to *landolphia* have been selected for exploitation, and a government survey party is now carrying out extensive investigations in Zululand.

A Rubber Production Research Committee has been formed to control all research work on these rubbers and to coordinate data. While it seems clear that there is abundance of latex available, the chief problems are suitable labor to extract the rubber from the vine and, in the case of the *Euphorbia*, the problem of separating the resin from the rubber.

For these reasons the public is cautioned against over-optimism, and meantime all efforts are being made to conserve rubber; the government is exercising the strictest control on the use of tires and other rubber goods and is further endeavoring to induce concerns to form transportation pools to permit a large number of vehicles to be taken off the road. When existing tires on certain types of vehicles are worn out, no permits for new tires will be issued.

VENEZUELA

Rubber production in Venezuela is now a government monopoly, and only the government and its designated organizations have the right to fix prices or to buy and sell rubber. Persons convicted of hoarding or illegally selling raw rubber are liable to fines ranging from \$6 to \$3,000. To encourage exploitation of the rubber territories, the government is granting a premium of \$0.245 a pound to contractors producing more than one ton of rubber a year. The price for *Hevea brasiliensis* smoked sheet, deliverable at Ciudad Bolívar, has been fixed at \$0.454 per pound; for smoked, washed and dried balls, \$0.432 per pound; the price for Castilloa rubber, delivered in Caripito, in thin dried sheets, is \$0.424, and for heavy, crude sheets, \$0.36.

New Publications

(Continued from page 512)

"What Your Government Expects of You and Your Tires." Reprinted from ODT Order No. 21. The B. F. Goodrich Co., Akron, O. 12 pages. "A Summary of Data on Synthetic Rubber." The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y. November 25, 1942. 22 pages.

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**ARMY
Ducks****HOSE and BELTING****Ducks****Drills****Selected****Osnaburgs****Curran & Barry****320 BROADWAY****NEW YORK**

COTTON & FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES					
Nov.	Dec.	Jan.	Jan.	Jan.	Jan.
Futures 28	26	2	9	16	23
Jan.....	19.34	19.48
Mar.....	19.08	19.43	19.64	19.68	19.75
July.....	18.34	18.94	19.27	19.52	19.46
Oct.....	18.21	18.88	19.20	19.44	19.36
Dec.....	18.88	19.21	19.38	19.32	19.26

A DAY-TO-DAY fluctuation, which did not prevent spot prices continuing upward, was the result of the past month's nervous buying. Concern over the attitude of the new Congress, government purchases of lend-lease yardage, and approval of the Pace Bill by the House Agriculture Committee were some of the contributing factors in the irregular market. Legislation on stabilization of corn and soft wheat prices leads the market to believe similar action may be taken with cotton should prices, now around parity, continue to go up. A depressing influence on the market was the purchase of approximately 237,000 bales of cotton for lend-lease purposes and the favorable war news during the month. The price of 15/16-inch spot middling grade rose, despite up-and-down fluctuations, from 21.07¢ a pound on January 6 to 21.51¢ on January 22 and closed at 21.40¢ February 1.

The Department of Agriculture announced a purchase program which would insure adequate supplies of both American-grown and Puerto Rican Sea Island Cotton of the long-staple varieties used in many specialized war fabrics. The Commodity Credit Corp. will purchase these cottons at prices that will compensate growers for low yields, and requests for labor, farm machinery, and deferment from the draft will be given special consideration in order to make the planting of the better grades as attractive as possible. The 1943 cotton loan program has also considered the planting of longer staples by advancing the loan rates, based on 15/16 middling, to 90% of parity. Premiums and discounts on this grade will decrease the short cotton to 85 points below the base rate and increase the long cotton, which was 85 points above the base rate in 1942, to 120 points above this year. A reduction of 35,000 acres in the growing of American-Egyptian long-staple cotton production has been made to enable growers to plant more livestock feed, and sets the 1943 goal at 160,000 acres. The 1943 cotton acreage allotment, as announced by Secretary of Agriculture Wickard, provides for 26,584,966 acres, although it is not expected that the entire acreage allotment will be planted.

Fabrics

Between 16,000,000 and 17,000,000 yards of sheetings of raincoat quality were up for bidding to fill the Army's request, making the demand for this cloth exceedingly heavy even though deliveries are reported to be spread over six months. Inability to furnish this grade in the time required may make it necessary to divert some printcloth looms to absorb some of the excess. A reported 5,000,000 pounds of belting duck have been sold to lend-lease.

Tire fabrics were again the only quality to change in price, increasing another ½¢.

New York Quotations

January 25, 1943.

Drills

38-inch 2.00-yard	yd.
40-inch 1.45-yard	yd.
50-inch 1.52-yard	yd.	\$0.29
52-inch 1.85-yard	yd.	.237
52-inch 1.90-yard	yd.	.23223/.2314
52-inch 2.20-yard	yd.	.2051
52-inch 2.50-yard	yd.	.185
59-inch 1.85-yard	yd.	.23851

Ducks

38-inch 2.00-yard D. F.	yd.	.2112
40-inch 1.45-yard S. F.	yd.	.294
51½-inch 1.35-yard D. F.	yd.	.3312
72-inch 1.05-yard D. F.	yd.	.43
72-inch 17-21 ounce	yd.	.487

Mechanics

Hose and belting	lb.	.4234
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Tennis

51½-inch 1.35-yard	yd.	.3112
51½-inch 1.60-yard	yd.	.2738
51½-inch 1.90-yard	yd.	.2318

Hollands—White

Blue Seal

20-inch	yd.	.1312
30-inch	yd.	.2414
40-inch	yd.	.27

Gold Seal

20-inch No. 72	yd.	.1412
30-inch No. 72	yd.	.2534
40-inch No. 72	yd.	.29

Red Seal

20-inch	yd.	.1214
30-inch	yd.	.22
40-inch	yd.	.2412

Osnaubergs

40-inch 2.34-yard	yd.	.1512
40-inch 2.48-yard	yd.	.1478
40-inch 2.56-yard S. F.	yd.	.145878
40-inch 3.00-yard	yd.	.1234
40-inch 7-ounce part waste	yd.	.15
40-inch 10-ounce part waste	yd.	.2138
37-inch 2.42-yard clean	yd.	.1514

Raincoat Fabrics

Cotton

Bombarine 64 x 60	yd.
Plaids 60 x 48	yd.
Surface prints 64 x 60	yd.	.08971

Sheetings, 40-inch

48 x 48, 2.50-yard	yd.	.16200
64 x 68, 3.15-yard	yd.	.13968
56 x 60, 3.60-yard	yd.	.11944
44 x 40, 4.25-yard	yd.	.09764

Sheetings, 36-inch

48 x 48, 5.00-yard	yd.	.08600
44 x 40, 6.15-yard	yd.	.06991

Tire Fabrics

Builder

17½ ounce 60" 23/11 ply Karded peeler	lb.	.54
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Chafe

14 ounce 60" 20/8 ply Karded peeler	lb.	.53
9½ ounce 60" 10.2 ply Karded peeler	lb.	.53

Cord Fabrics

23 5/3 Karded peeler, 1½" cotton lb.	lb.	.54
23 4/2 Karded peeler, 1½" cotton lb.	lb.	.52
23 5/3 Karded peeler, 1½" cotton lb.	lb.	.53

Leno Breaker

8½ ounce and 10½ ounce 60" Karded peeler	lb.	.54
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United States

(Continued from page 518)

2,307,663. **Tire Lock.** M. K. Bernhardt, South Bend, Ind.

Dominion of Canada

409,008. **Tire Valve Stem.** Dill Mfg. Co., Cleveland, assignee of J. C. Crowley, Cleveland Heights, both in O. U. S. A.

409,197. **Tire Valve Core.** Dill Mfg. Co., Cleveland, assignee of A. E. Bronson, Shaker Heights, both in O. U. S. A.

409,212. **Wheel Balancing Means.** General Tire & Rubber Co., assignee of H. T. Kraft, both of Akron, O. U. S. A.

409,237. **Tire Valve.** Ohio Injector Co., Wadsworth, assignee of W. F. Goff, Akron, both in O. U. S. A.

TRADE MARKS

United States

399,064. **TarsalEase.** Footwear. Gimbel Bros., Inc., New York, N. Y.

399,071. **Douglasarch.** Footwear. W. L. Douglas Shoe Co., Brockton, Mass.

399,072. **Slightweight.** Girdles. Sturm & Scheinberg, Inc., New York, N. Y.

399,089. **Seymour Troy Originals.** Footwear. S. Troy, New York, N. Y.

399,110. **Johnson's.** Rubber preservative, renewer, and cleanser. S. C. Johnson & Son, Inc., Racine, Wis.

399,111. **Johnson's Rubber Dressing.** Dressing to coat, preserve, renew, and clean all rubber, automotive, and household articles. S. C. Johnson & Son, Inc., Racine, Wis.

399,151. Representation of a label containing the words "The Normal Gait Shoe." Footwear. Richard A. Fargo, Evanston, Ill.

399,153. Representation of a label containing the word "Pharis." Fuses for electrical appliances. Pharis Tire & Rubber Co., Newark, O.

399,171. **Sturdiflex.** Foundation garments. I. B. Kleinert Rubber Co., New York, N. Y.

399,198. **Firestone.** Non-precious metal hand and pocket mirrors. Firestone Tire & Rubber Co., Akron, O.

399,219. **Kenvar.** Insulated electrical wire. Kennewick Wire & Cable Co., Phillipsdale, R. I.

399,273. **V-Sealed.** Raincoats. Chicago Rubber Clothing Co., Racine, Wis.

399,313. **Bar-Flex.** Shoes. Northern Rubber Co., Ltd., Guelph, Ontario, Canada.

399,324. **Long T Ball.** Golf balls. A. W. Morgan, Yonkers, N. Y.

399,325. **Scot T Land.** Golf balls. A. W. Morgan, Yonkers, N. Y.

399,333. **Wisp-O-Youth.** Brassieres. Lucille of Hollywood, Inc., Los Angeles, Calif.

399,367. **Sani-Sweet Slackshield.** Shields for trouser-like garments, shorts, etc. J. H. Crews, doing business as Sportswear Specialties Co., Los Angeles, Calif.

399,395. **Koron.** Unplasticized vinyl resins. B. F. Goodrich Co., New York, N. Y., & Akron, O.

399,406. **Tredo-Gage.** Gages for measuring tread depths of tires. Studebaker Corp., South Bend, Ind.

399,412. **Butaprene.** Synthetic rubber or rubber-like materials with or without natural rubber. Firestone Tire & Rubber Co., Akron, O.

399,414. **Pictar.** Liquid cyclic hydrocarbons plasticizers for rubber and synthetic rubbers. Pennsylvania Industrial Chemical Corp., Clairton, Pa.

399,530. Representation of a circle enclosing a horse's head with the word "Thorobred." Belts, tires and inner tubes. Dayton Rubber Mfg. Co., Dayton, O.





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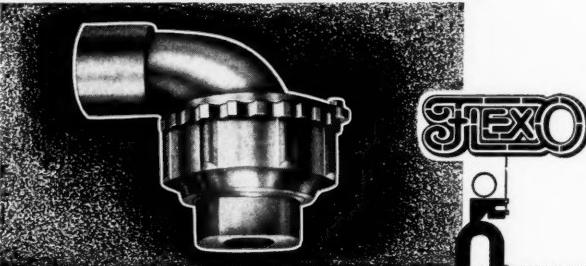
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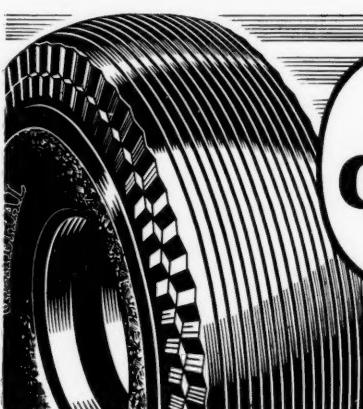
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FOR SALE: 1—Southwark 1000-Ton Hydraulic Press, 24" dia. ram, complete with horizontal Hydraulic Pump and motor; 1—W.S. Hydro-Pneumatic Accumulator, 2500 PSI, 8 gal., with IR m.d. compressor; 1—Hydro-Pneumatic Accumulator, 2000 PSI, 16½ gals., complete with tank, compressor and piping; 1—Set of Compounding Rolls, 18" x 44"; 1—W.S. 15" x 18" Hyd. Press, 9" dia. ram, 4" posts; 6—Semi-Automatic Hydraulic Molding Presses; 1—Farrel-Birmingham 16" x 36" Rubber Mill; Adamson 6" Tuber; 7—W.&P. Mixers; Dry Mixers, Pulverizers, Grinders, Tubers, Hydraulic Pumps, Calenders, etc. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York, N. Y.

FOR SALE: 3—HYDRAULIC PRESSES; 7—CHANGE CAN MIXERS, 8 to 40 gals.; No. 20 Banbury Mixer; W. & P. Mixers, Lab. to 200 gal.; 6—Preforming Machines; 3—Vacuum Shelf Driers. Your inquiries solicited. BRILL EQUIPMENT COMPANY, 183 Varick St., New York, N. Y.

FOR SALE: FIRST-CLASS CONDITION 2—40 H.P., 220-volt, 3-phase, 60-cycle, MT-346, 720 RPM G. E. motors; also 2—25 H.P., 220-volt, 3-phase, 60-cycle, K-332 G. E. motors complete controls and starters. Address Box No. 537, care of INDIA RUBBER WORLD.

2—16 x 40" MILLS; 3—48" MILLS; 2—4-ROLL WASHERS; 1—72" Doubling Machine; 1—60" Facing Calender; 1—60" Brush Machine; 4—51" New Spreaders; 2—60" New Spreaders; 10 New 200-gallon Churns; 4 Hydraulic Presses; 1 Link Belt Conveyer; 1 Sheridan Toggle Press; 2—15,000-gallon Tanks; 4 Hydraulic Tire Vulcanizers, 4' x 12'; 1—#10 Taylor-Stiles Rubber Chopper; 1 Span Grinder; 1—50" National Paper Cutter; 2—#56 Devine Vacuum Driers; 1—8 x 18" Outsole Calender; 1—3-roll 60" Calender; 1—3-roll 54" Calender; 4 Embossing Calenders; 6 Tubing Machines; 1—36" Bonnot Pulverizer for grinding hard rubber. Address Box No. 540, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

WANTED: Banbury Mixer, Mills, Calender, Hydraulic Presses, with pump and accumulator, Tubers, Any Condition. Address Box No. 539, care of INDIA RUBBER WORLD.

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